The Black Pyramid of Amenemhet III at Dahshur

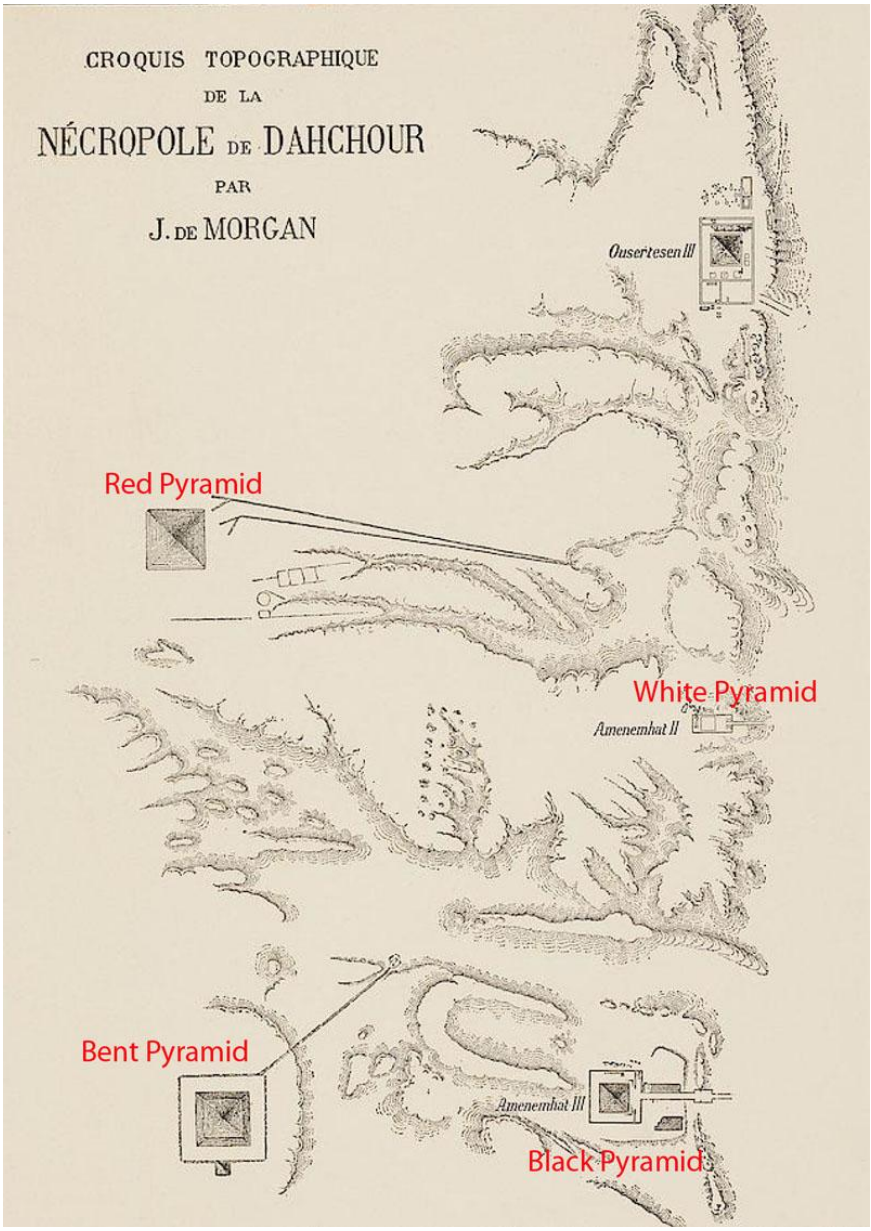
A Layman's guide

Keith Hamilton 10th October, 2020

Image courtesy of Jon Bodsworth

The above ruinous mound of mud brick is all that remains of the pyramid superstructure built by Amenemhet III of the 12th dynasty. Perring who visited the structure in 1839 stated; *"*It *is called by the Arabs, "Haram é Sodah," the Black Pyramid, and is now much destroyed, as it has afforded materials for the houses and tombs of the neighbouring village of Mensheeh."*[1]

[1] Operations carried on at the Pyramids of Gizeh, Volume 3, pg 70



The Black pyramid is east of Sneferu's Bent pyramid; Amenemhet's predecessor Senwosret III (spelt Ousertesen above) built his pyramid complex north-east of Sneferu's Red pyramid: these two large brick core pyramids are often referred to as the Northern and Southern brick pyramids of Dahshur.

Exploration

In the modern era, Perring is probably the first to make some observations on the structure, though it amounts to a very brief page of text. The huge amount of debris

surrounding the site prevented access to the pyramids interior, though in Howard Vyse's Volume 3, he states; "*Mr. Perring did not discover any traces of the chamber, the roof of which is stated by Dr. Richardson, and by others, to have fallen in".*[2] This statement has been used to suggest that access to the pyramids substructure was available prior to Perring's visit.[3] However, having read Dr Richardson's account[4] of his visit to the Dahshur pyramids this seems to be unlikely. In his account he describes the interior of the Red pyramid and then states;

> **Near to this stands the brick pyramid which we did not measure. It is much fallen down on the north side, and looks as if the roof of one chamber had given way and the walls fallen in ; the bricks are sun-dried and remarkably fresh ; they have been made of mud and cut straw, in the same manner that bricks are made in Egypt in the present day.**

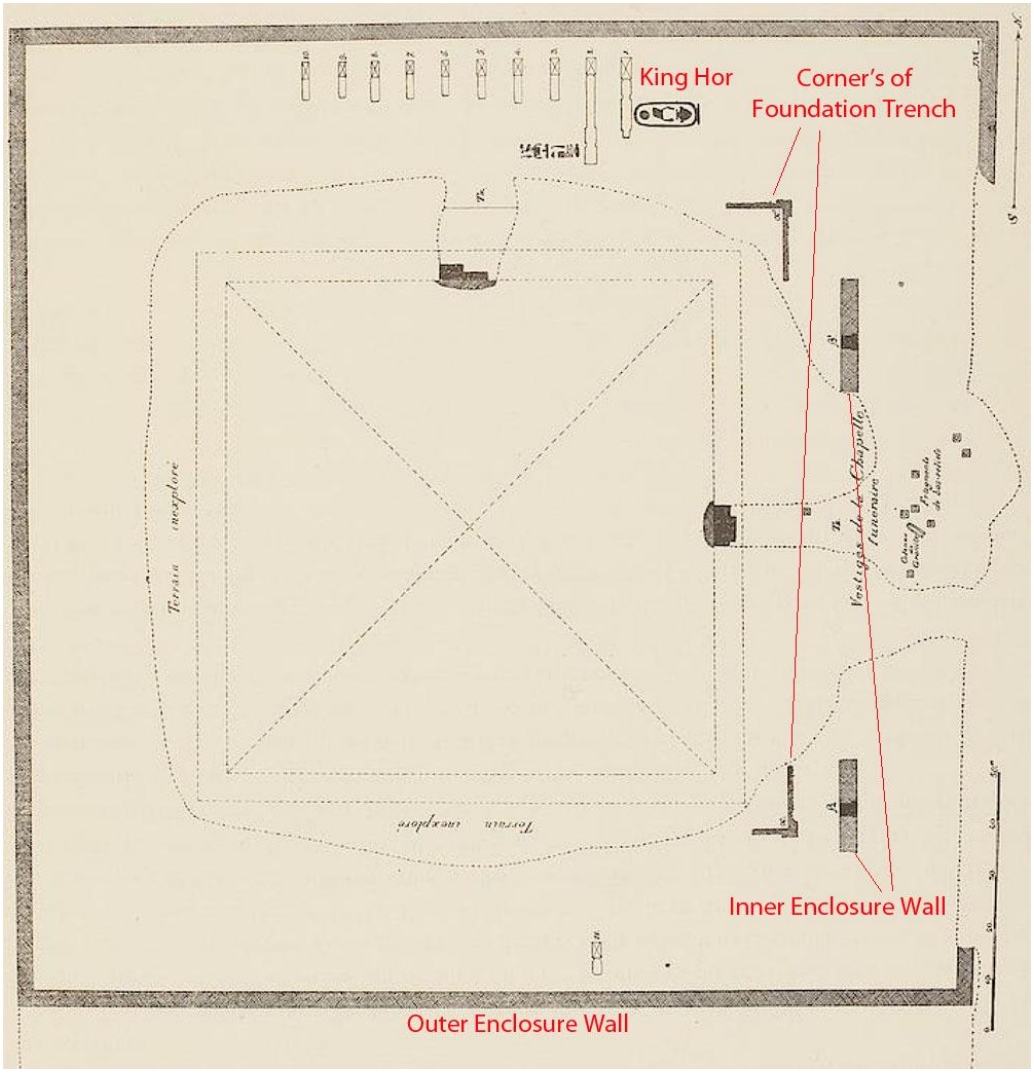
This appears to be the statement that authors have confused with access to the Black pyramid, though the nearest Brick pyramid to the Red Pyramid is that of Senwosret III. Indeed, there is nothing in the five pages of text that he assigns to the Dahshur pyramids to indicate that he entered any brick pyramid; moreover, he states *"It would be curious to observe how this lover of brick formed the roofs of the passages and chambers of his pyramid."*

Earlier incursions into the pyramid after dynastic times are an obvious unknown, though Dieter Arnold who undertook the major excavations of the site, states;

"An illegible Arabic graffiti on the north wall of the entrance stairs, however, shows that the main entrance must still have been accessible in later times. When withdrawing from one of the last such operations, the intruders roughly closed the entry to the east staircase again with blocks and bricks for unknown reasons."[5]

[2] Ibid, page 70
[3] Der Pyramidenbezirk des Königs Amenemhet III. In Dahschur. D Arnold, Vol 1, 1987, page 95
[4] Travels along the Mediterranean, Vol II, 1822, pages 145 - 150
[5] Der Pyramidenbezirk des Königs Amenemhet III. In Dahschur. D Arnold, Vol 1, 1987, page 95

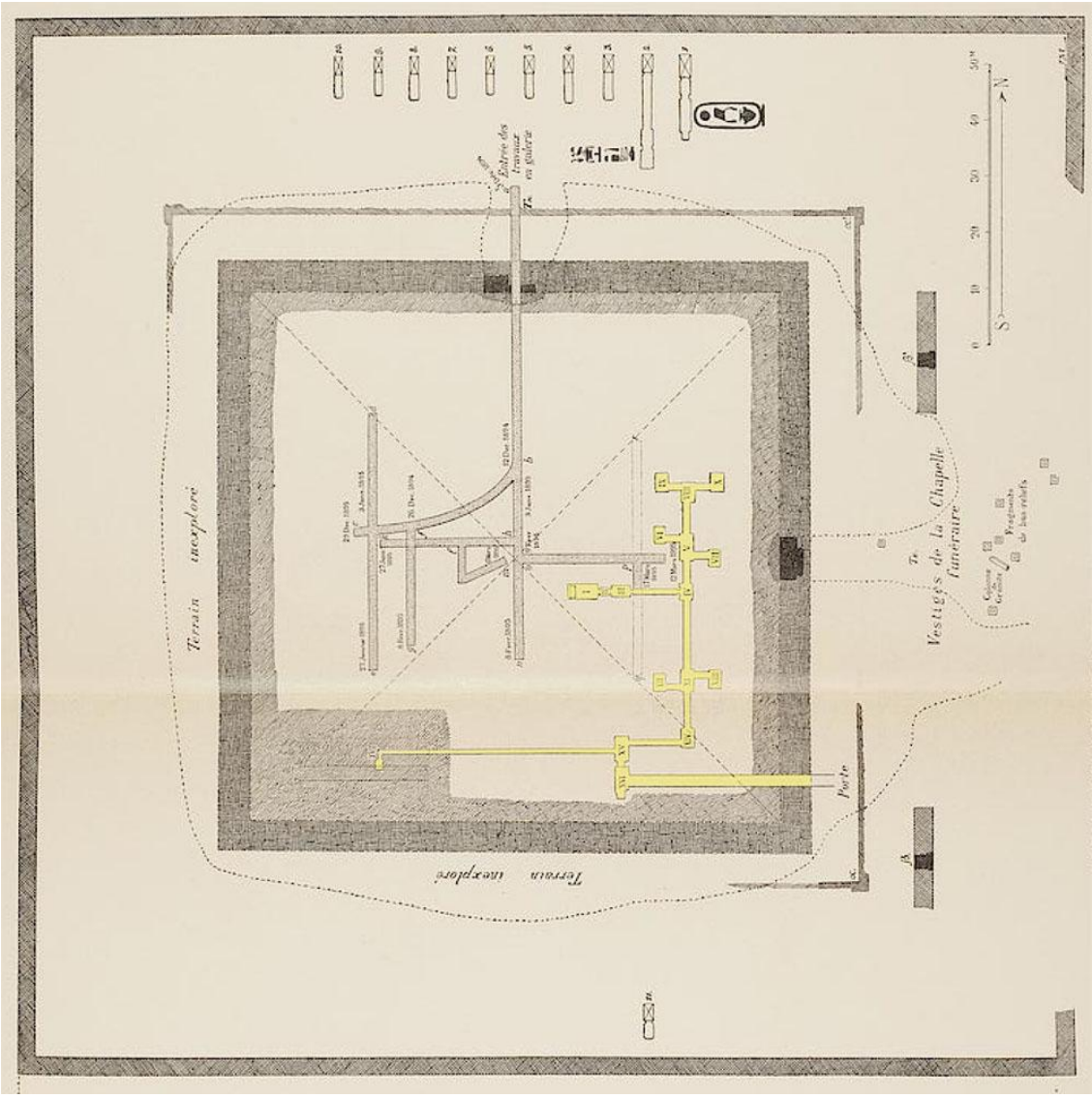
Lepsius like Perring would make some cursory remarks on the site, but major work on the site would start in April of 1894, under the direction of Jacques De Morgan. This work carried out over two seasons, avoiding the heat of the summer, came to an end in April 1895. It was not limited to the Black pyramid, but encompassed all three Middle kingdom pyramid complexes, and as a result details on all three complexes tend to be limited; though we have to remember the era in which he worked.



The above plan[6] of the Black pyramid highlights De Morgan's findings in his first season, and we can see that he has made cuttings into the huge debris that surrounds the pyramid on its north and east sides in the hope of finding an entrance, but to no avail. Among his finds were fragments of the pyramid temple,

[6] Fouilles A Dahchour, 1895, page 86, fig 205

some of which bore the cartouche of Amenemhet III; he also discovered ten shaft tombs to the north, only two of which were used, the first belonging to King Hor, a 13th Dynasty king.



The plan[7] above highlights De Morgan's progress in his second season (I have highlighted the chambers and passages that he discovered). Here he dug a tunnel from the north face to the centre of the pyramid and beyond; in total some 225 metres were dug out; De Morgan would state, *"Never had so considerable underground work been done in Egypt for the search of a tomb; it lasted a hundred days, from December 5, 1894 to March 17, 1895."*[8] On the 17th of March workers

[7] Fouilles A Dahchour, 1903, plate XVII
[8] Ibid, page 104

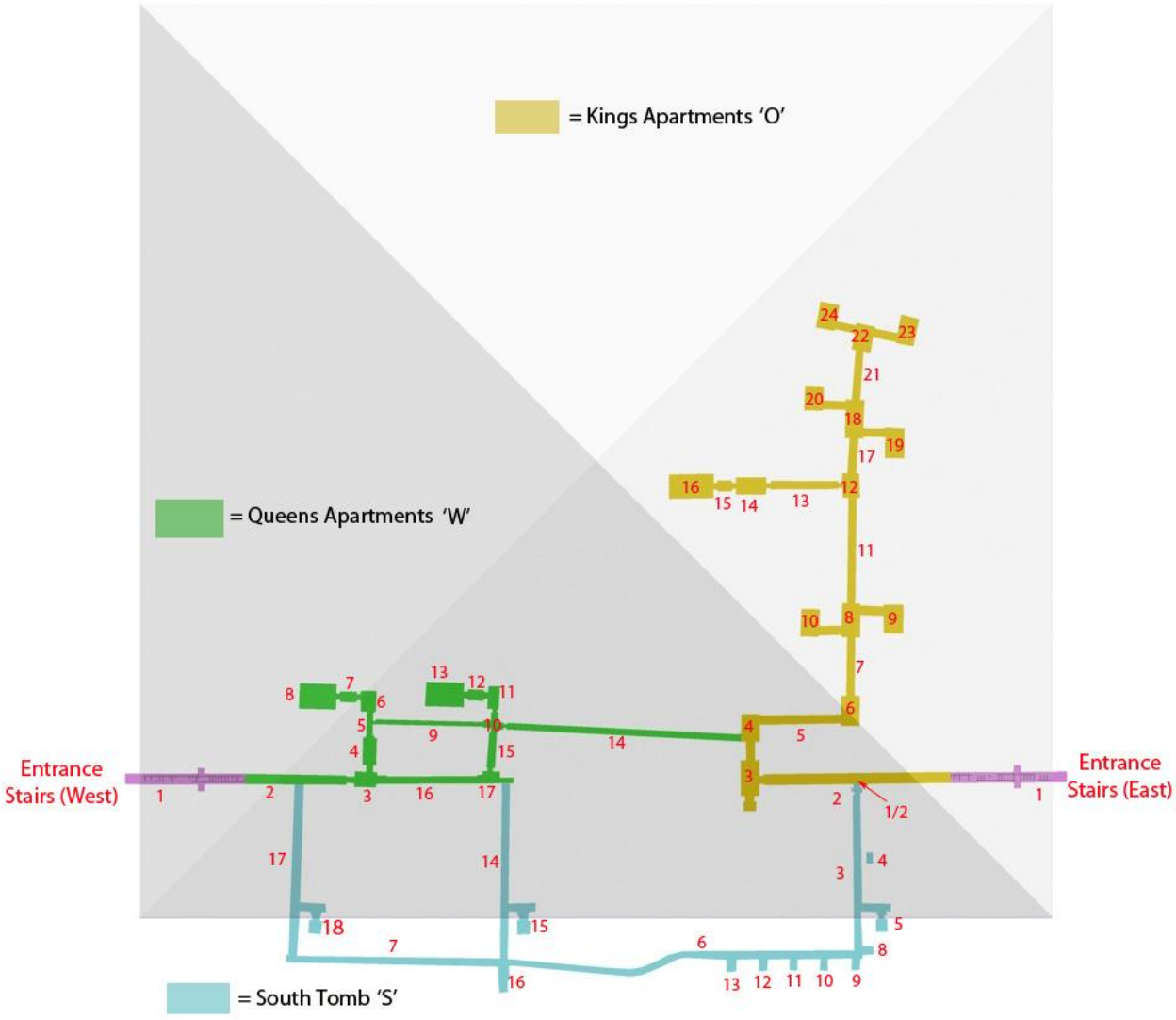
had come across some ceiling slabs; at the time De Morgan was in Cairo, so M.G.Legrain sent an express message; nothing was touched until his return, were the slab was broken and access to the substructure was made on the 19th of march 1895. Given the complexity of the substructure, De Morgan provides very scant detail on the numerous chambers and passages; indeed, as we will see, he missed quite a few chambers and passages. His description of the substructure hardly amounts to a page of text, and no detailed drawings are given, other than the plan on the previous page. Unfortunately, De Morgan spends more pages and ink casting doubt on Petrie's findings at the pyramid of Hawara, which Petrie attributed to Amenemhet III. [9]

De Morgan's cursory description of the complex, tells us very little, we would have to wait until 1976 when modern excavations were carried out by Dieter Arnold. Eight seasons were given to excavating the site, with excavations being stopped in 1984: here, for the first time we get detailed drawings and photographs, and a clearer picture of the labyrinth of chambers and passages that reside under the Black pyramid. Arnold's findings were published in '*Der Pyramidenbezirk des Königs Amenemhet III. In Dahschur, Volume 1, 1987'*; in this publication reference is made for more detail coming in volume 2, unfortunately, this was never published. As far as I am aware, no further work has been done on the structure, though it is now open to tour groups, and I am very grateful to Colin Reader for the use of his images.

This guide is based on the publications highlighted above; these are largely in French or German: translation software can be a bit hit and miss, but hopefully errors in translation are few.

The Black pyramid has quite an extensive subterranean network of passages and chambers; Arnold has ordered the network into three sections: all chambers and passages are allocated a number with a letter prefix, such that O16 denotes the king's burial chamber (it is believed that the king was buried in his Hawara pyramid). His Queen 'Aat' was buried in W8, and W13 is believed to contain an unknown queen. The southern section, titled the South Tomb, was not discovered by De Morgan; it contained many small chambers and it has been suggested that these were for the Ka of the deceased. Possible intrusive burials appear in each entrance staircase, along with chambers O3 & O4. I have created a schematic plan overleaf based on Arnold's plate 37 to assist in location.

[9] Ibid, pages 106 -109



The above plan gives us a rough idea of the complex network (compare to De Morgan's plan on page 5). The chambers can be at different levels, accessed by several stairways, which I have omitted in the above plan for simplicity, for example the small chamber S1/2, is not visible in the plan above as it is under the passage of O2.

The Foundation Trench

The pyramid has two entrances, which De Morgan never cleared; Arnold would use the approximate position from De Morgan's plan to help locate the east entrance. His initial cutting through the debris was too far south of the entrance, so he excavated further north for some 7m to find the entrance; this extra work helped in exposing some of the pyramids foundation trench. The exact form of the foundation trench is not known with certainty as Arnold was unable to reach the

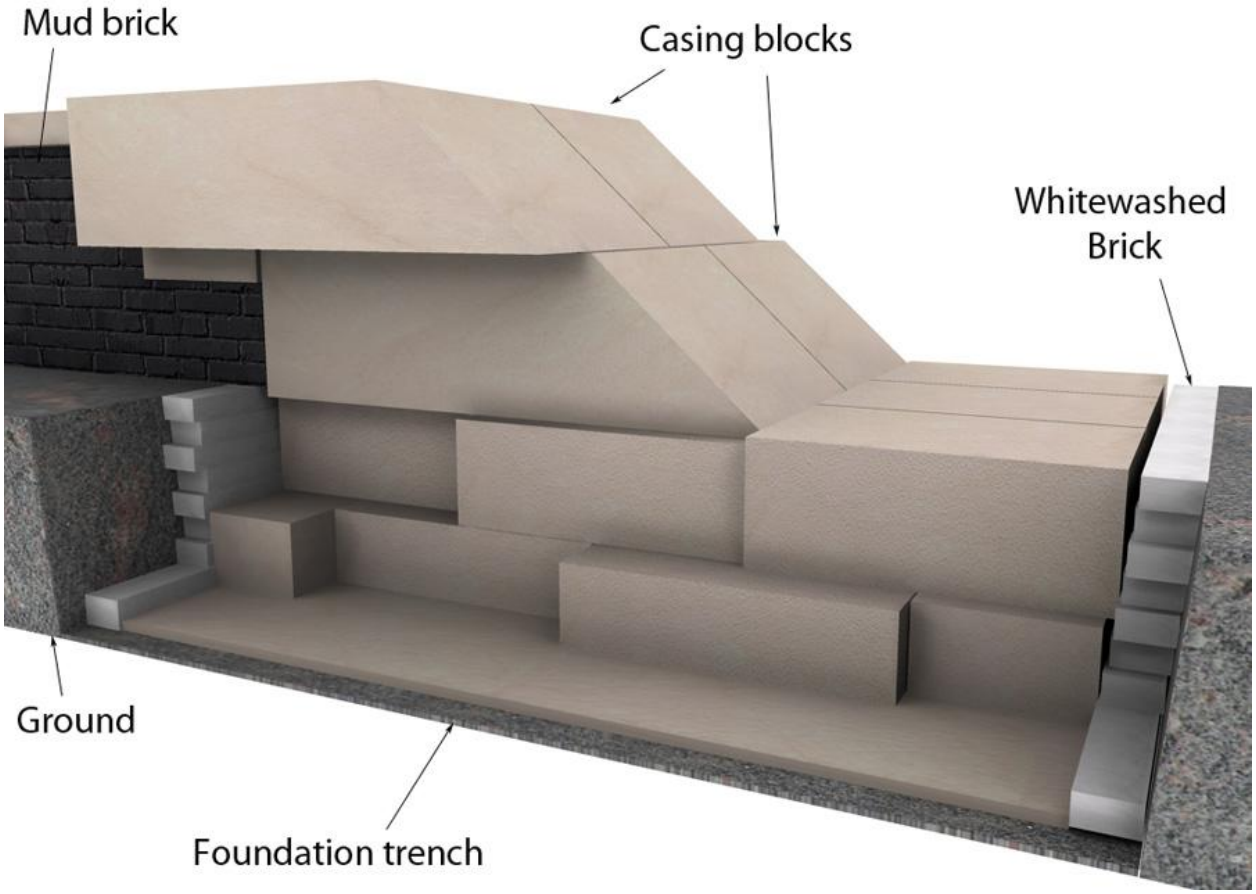
eastern edge of the trench. The foundation trench was discovered by De Morgan; sounding towards the northeast corner of the pyramid, De Morgan states; "*They still encountered debris from the bottom until they came to a brick wall hidden deep underground and which seems to have bordered a kind of ditch that once surrounded the colossus of bricks"*[10] He describes the wall as being two bricks wide and it appears to have been reinforced at the corners with brick piers. The ground between the wall and the pyramid is described as being perfectly flat and cut with great precision. Unfortunately De Morgan provides no measures for this trench, though his plate XVII (see page 5) suggests that it is some 8m wide, which seems excessive compared to his predecessor's pyramid, whose trench was some 4.50 to 4.90m wide.[11]

These foundation trenches are quite common to Middle Kingdom pyramids, and can vary in width and depth; some are lined in brick, others not, there appears no hard and fast rule, though the quality of the ground that they cut into, probably played a part. The general idea is that the trench contained fine limestone blocks which supported the pyramid casing; inside of this trench a platform left in the rock would contain the brick core of the pyramid.

La grande pyramide de briques et la tranchée du revêtement. - Angle Sud-Est. PL. XIV

Remains of the foundation trench at the Southern South Saqqara Pyramid

[10] Fouilles A Dahchour, 1895, page 88
[11] The Pyramid Complex of Senwosret III at Dahshur, D.Arnold, 2002, page 27



None of the foundation trenches are particularly well preserved, all being largely robbed of their stone; the above reconstruction is loosely based on Mackay's description of Mazghuna South. This small pyramid had a foundation trench some 5m wide by 1m deep; the foundation blocks were laid on a clean bed of sand with the retaining walls of the trench plastered with mud and then whitewashed.[12]

More excavation would be required on site to better understand the foundation trench; though De Morgan's plan drawing suggests it is some 8m wide, his drawings do have a tendency to be inaccurate, as demonstrated in my White Pyramid guide, so caution is required. Arnold's excavation by the entrance suggest that the foundation trench is some 3m deep, consisting of three block layers; this appears quite deep compared to other foundation trenches; the Southern South Saqqara Pyramid on the previous page was 1.80m deep.

[12] Labyrinth, Gerzeh and mazghuneh, 1912, page 41

Revêtement de la pyramide. — 10 Mai.

The above image[13] purports to show some of the surviving casing at the base of the pyramid; though as Arnold has noted it is difficult to determine if the stones adhering to the brick core are casing stones or backing stones from this image[14]: the line of blocks directly behind the standing figure might be one of the foundation layers.

[13] Fouilles A Dahchour, 1895, plate XL

[14] Der Pyramidenbezirk des Königs Amenemhet III. In Dahschur. D Arnold, Vol 1, 1987, page 10

The Casing

The damage inflicted upon the pyramid makes it difficult to determine the casing footprint, but it is generally thought to have a side some 200 cubits (105m) long. Dorner measured the foundation blocks at the entrances as 108m,[15] suggesting a possible pavement of at least 1.5m protruding from the casing edge: it is not known how far the foundation blocks continue under the casing.

Arnold could only penetrate into the pyramid by the two entrances and the pyramid temple; in these locations no in situ casing blocks could be found, though some sizeable backing blocks, also made from fine Tura limestone were found. These backing blocks along with casing fragments contained 35-40cm dovetail wooden cramps laid in a pink plaster bed. Channels were made in the abutting faces of the blocks to allow gypsum to escape when the blocks were pushed together, and lever holes were always on the side of the blocks showing that they were inserted from the side, not the front.[16]

The angle of the pyramid is another problematic area; Perring first measured the casing: "*Like the other Pyramids, it had been cased with stone from the Mokattam. One of the blocks had been worked to an angle of 57° 20', which, although steep, in some degree corresponds with the present shape of the ruin; and Mr. Perring observes that the angle would depend on the position of the blocks, as one block gave an angle of 57° 25', and therefore, that the beds of the blocks were no doubt differently inclined according to the shape of the building."*[17]

De Morgan would provide no angle information though he would say; *"Did this pyramid have two slopes as it does in its neighbour to the west, or did it only have one? It would be difficult to say, because today it only presents the aspect of a steep hill; however, I am led to believe that it was rhomboidal, if I judge from the inclination of the walls of the covering and the blocks of bricks which still exist,"*[18]

Arnold would find casing fragments varying from 54 to 56.7 degrees and suggested that this variability may have been down to the bearing surfaces of the blocks being not completely horizontal. [19] The lower part of the Bent pyramid falls

[15] Ibid, page 10
[16] Ibid, page 12
[17] Operations carried on at the Pyramids of Gizeh, Volume 3, page 71
[18] Fouilles A Dahchour, 1895, page 98
[19] Der Pyramidenbezirk des Königs Amenemhet III. In Dahschur. D Arnold, Vol 1, 1987, page 13

within this angle range and much ink has been spilt as to what its intended angle was! So the reader must forgive me if I avoid this minefield.

Image courtesy of Jon Bodsworth

Some 5 years after De Morgan's work in October 1900 the above pyramidion was found in the vicinity of the pyramid temple, and in excellent condition. Arnold gives the calculable angle as 54° 30´. Arnold would comment on the condition of the pyramidion; *"The good state of preservation of the surface gives rise to astonishment when one consider that the top of the pyramid has demonstrably been exposed to wind and weather up to the Armarna period, i.e. almost 500 years. The erasure of the Amun name in the royal cartouches shows, however, that the pyramidion in the Armarna period was not yet a discarded block in the temple rubble, but was still standing as a monument. For it can hardly be assumed that the persecutors of the Amun name also tampered with shattered monuments that were to be regarded as destroyed anyway. On the other hand, the question arises as to how Akhenaten's emissaries could know that the pyramidion, when it was still in its place 75m above the pyramidal foot contained the Amun name, and how*

they could have climbed a rather steep pyramid if it hadn't already lost part of its casing."[20]

The good condition of the pyramidion concerned O. Firchow, who suggested that it may not have been fitted and that the pyramid was unfinished.[21] Arnold would counter that the completeness of the rest of the pyramid complex, rather suggested that it was finished. The condition of the pyramidion is a concern to me; might we not expect more damage to it if it was dislodged and tumbled some 75m? If fitted it had a 1 in 4 chance of being found in the temple area; but the possibility cannot be discounted that the pyramidion always resided inside the temple; protected and easily found by Akhenaten's men who had easy access to erase the Amun element out of the cartouches. If we accept De Morgan's view that the pyramid resembled the Bent pyramid, then it is likely that any pyramidion that capped this upper section would display a shallower angle.

Bent Pyramid - Image courtesy of Jon Bodsworth

[20] Ibid, page 14
[21] Studien zu den Pyramidenanlagen der 12. Dynastie, 1942, 31f

The Bent pyramid displays a mean upper casing angle of 43° 5´ (Petrie)[22]. This angle is often thought to be replicated in the Bent's subsidiary pyramid and in Sneferu's nearby Red pyramid. On the Subsidiary Petrie gives;

"*The angle of the casing on a good block at the E.S.E. is 44° 34'; and on a worse example, 45° 3'; no other stone was in sufficiently good condition to be worth measuring"*[23]. For the Red pyramid he states;

"all I could do was to observe the present slope of the rough surfaces of the core masonry. This appears to be on the N. 44° 42', E. 44° 32', S. 44° 30', W. 44° 41´, mean 44° 36' ± 3'. Hence it is clearly not 45°; and the only likely rule for its construction seems to be a slope of 7 on a base of 5, as this would require an angle of 44° 34' 40", which is within the uncertainties of this pyramid. Vyse states this as 43° 36' 11", apparently just a degree in error.[24]

Could Amenemhet set out to replicate the Bent pyramid? The Bent's shape is generally accepted as a result of settlement, much like the Black pyramid: in my previous guides on the Bent pyramid I have questioned this settlement; however, the evidence from the subterranean apartments inside the Black pyramid is all too obvious. It is clear from the inside that the disaster happened whilst some chambers were still being built, and things had to be hastily rearranged; how far the mass of the superstructure had reached before this disaster is not known; but given that a pyramid holds most of its volume at a low level, the event could well have occurred before they even reached half its height. If for example we take the Black pyramid as having a base of 105m and a height of 75m and place a bend line at a similar ratio to that displayed at the Bent, the bend line at the Black would be at a height of 33.75m: at this level over 80% of the pyramid volume is accounted for. Given the poor site chosen for the Black pyramid, the disaster probably occurred before this level was reached, and if it was, what were Amenemhet's options? He could abandon the superstructure or reduce the upper angle to reduce the weight; if such a course of action was taken, a new pyramidion would be required with the appropriate angle: whilst the original may have been displayed in the Temple.

Further confusion can surround pyramidions, such as the one found at the Red pyramid, which does not agree with the pyramids casing.[25] More recently, further confusion can be highlighted at the Bent's small subsidiary pyramid; whilst

[22] A season in Egypt, 1887, page 30
[23] Ibid, page 31
[24] Ibid, page 27
[25] See my Red Pyramid guide

reading Jean-Philippe Lauer's *'Le Mystère des Pyramides'* He provides a table of pyramid angles and notes the subsidiary as displaying just over 50 degrees, This seemed well in excess of Petrie's findings, which most publications appear to accept. When Petrie explored Dahshur, debris was still a major problem and he was limited to what he could observe; for example, no Red Pyramid casing was visible to him. Today much clearance has been done and more has become visible.

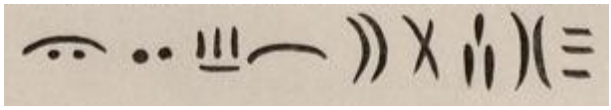
Image courtesy of Jon Bodsworth

The above image of the entrance to the subsidiary highlights surviving casing; recently Colin Reader used a clinometer on the east and north face : ten locations were measured, the results were one instance of 45, one instance of 47, and 8 instances of 48 degrees. As a check he used the clinometer on the surviving casing stones of the Red by its temple and obtained 43-44 degrees. On a second trip, using a different instrument he obtained the same results. I am grateful to Reader for sharing these results; and it would be beneficial that further research is carried out to determine these casing angles; but it highlights the confusion to be found in a lot of literature. The northern Brick pyramid has also been subject to different angles

from various authors; though Arnold's excavations give a ratio of 6:5 or just over 50 degrees for this pyramid; he would also suggest this angle for the Bents subsidiary.[26] Confusion abounds inside and out of too many structures, in that the existing data, in many cases over a century old, must be treated with caution until more modern surveys are carried out: unfortunately, architectural study, as I have mentioned in other guides, is a low priority for Egyptology.

The brick core may have been laid on a raised plateau left by the foundation trench, as seen in other pyramids; unfortunately, excavations were unable to determine if such a plateau exists. In Perring's day he gave the height of the surviving brick core as 47.5m; or some 63% of the pyramids height if it was intended as 75m high.

Many of the bricks (Arnold would calculate some 20 million for the pyramid and other areas of the complex such as walls etc) had makers marks impressed into them.



Some of the Marks were noted by Perring (shown above); he would also comment that; *"*It *is built in the same manner, but not so carefully, as the other brick pyramid."*[27] Arnold states that the bricks are laid without mortar; instead, they reside on thin layers of sand. A better preserved section of the core by the west entrance, indicated a 3-4m brick step behind the limestone casing.[28] As like so many Middle Kingdom pyramids, the bricks tended to have their narrow ends facing the outside; the image overleaf gives an idea.

[26] The Pyramid Complex of Senwosret III at Dahshur, D.Arnold, 2002, page 26
[27] Operations carried on at the Pyramids of Gizeh, Volume 3, page 70
[28] Der Pyramidenbezirk des Königs Amenemhet III. In Dahschur. D Arnold, Vol 1, 1987, page 10-11

Image courtesy of John Bodsworth

The ground upon which the pyramid sits was described by De Morgan;

"The rock at this point on the Dahshur plateau bears no resemblance to that on which the northern pyramid rest. The sandstones are replaced by thick bands of very hard brown clay (because it has lost its moisture) and cracked in all directions. This kind of ground is very unsuitable for underground work because it crumbles with the greatest ease;"[29]

The site was a poor choice, sited low on the valley floor, rising ground water allowed the ground to be malleable, allowing the crushing weight of the pyramid to settle and cause no end of problems to the substructure. Along with the numerous stress cracks present in the chambers, the settlement is best illustrated in the chamber floors; here, the walls had their own foundation stones, with the majority of the chamber floor being detached from the walls: this allowed the body of the chamber to sink several centimeters below the floor paving, leaving a noticeable step in the floors.

This settlement appears to have happened whilst several chambers were still being lined with fine limestone, mostly in the area of the Queens apartments, where stone was substituted with brick and wooden beams.

The Eastern Entrance

The eastern entrance predominately serves the kings apartments and is much damaged. While De Morgan noted the position of this entrance in his plan, he did not clear the entrance staircase. The entrance was cleared by Arnold in 1976; in clearing the debris in front of the entrance he discovered a funnel shaped brick retaining wall immediately in front of the entrance, probably to hold back earth to enable access to the pyramid, be it by robbers or later intrusive burials. A somewhat unusual blocking stone was found partially dislodged and jammed in the passage, with some of its top surface removed to allow access for robbers: a similar sized block may have resided behind which had to be cut through; after this, small masonry blocks some 70-100kg mortared together filled the stairway, several of which were found in situ. We have two possible later burials in chambers O3 & O4 along with a burial cut into the staircase; so it's difficult to determine how many openings would have been made in this passage in its history.

[29] Fouilles A Dahchour, 1895, page 88

What Arnold discovered is likely not the original intended closure design; though we have some better preserved examples from other sites.

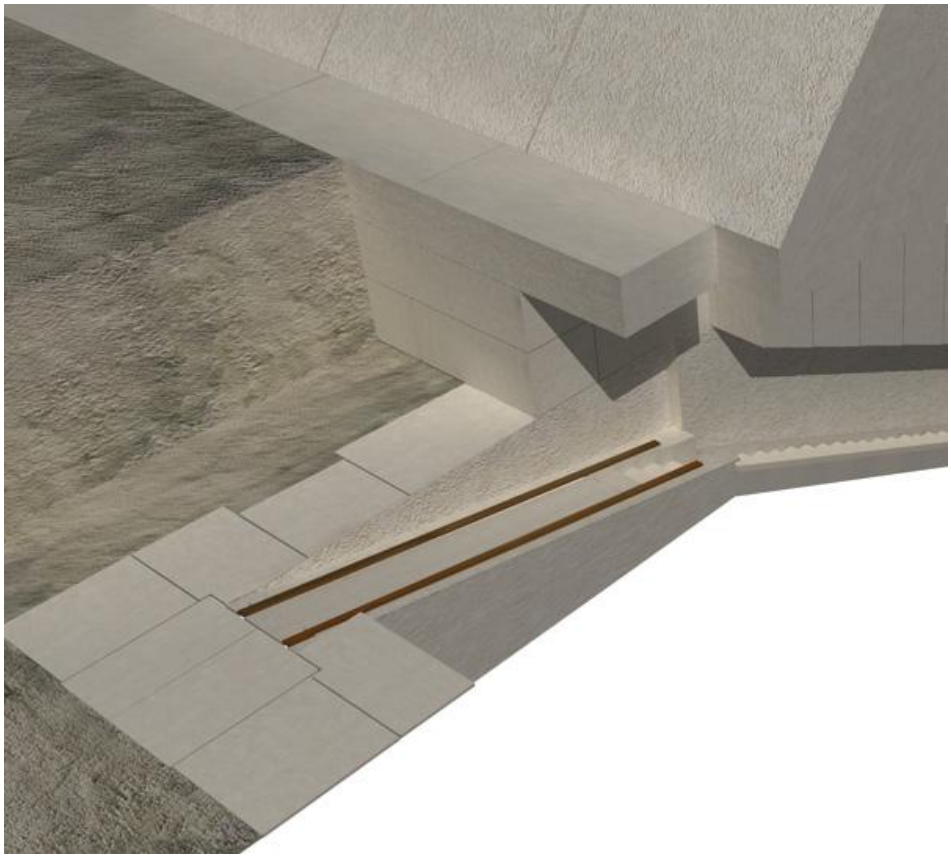
Image courtesy of State Archives of Neuchátel, Fonds Jéquier (1852-1946), Pyramide d'Ouserkara-Khenzer; Aramaic epigraphy, 1 Jéquier-16.

The above image of the entrance to Khendjer's pyramid shows it exiting in the floor of its foundation trench; the trench retaining wall can be seen, with stairs leading down to the trench either side of a deeper opening in front of the entrance, which has its own access steps at its rear. This opening may have been for the storage of a closure stone, which would have been slid forward with the help of the grooves visible in the limestone floor and seal the entrance. This stone would likely merge with the surrounding foundations stones, in a bid to thwart robbers.

The old reports don't provide much information to work on, but the above reconstruction may have been one possibility in the closure of Khendjer's pyramid.

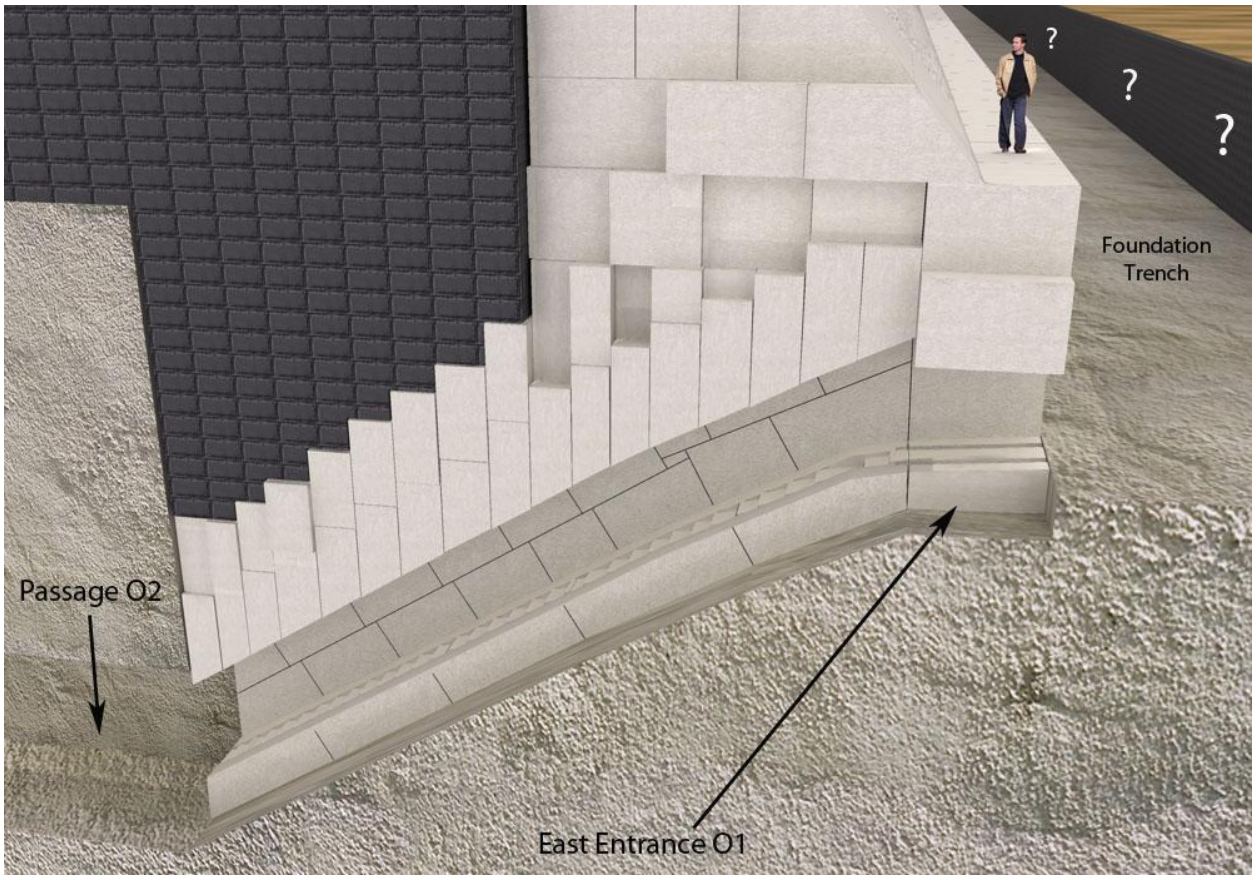
Next to Khendjer's pyramid we have the impressive Southern South Saqqara Pyramid;[30] this has a well preserved entrance that also appears to exit in the floor of its foundation trench. Here we also see the grooves to assist in moving heavy masonry, this time in a long sloping ramp, which terminated at the top of the stairs. The width here was slightly wider than the stairs; this provided two faces for any sealing blocks to abut against.

[30] See my guides on these structures , available at academia.edu



The above reconstruction of the Southern South Saqqara Pyramid entrance shows that there was variability in methods for sealing the entrance. What may have been originally intended for the Black pyramid is unknown, due to the considerable damage in the area. His predecessor's Northern brick pyramid, can offer no clues, as entry to this pyramid was via vertical shafts: the Black pyramid being the first in the Middle Kingdom to use a stairway as entry. The Northern brick pyramid did have a foundation trench about 4.40-4.50m wide; its depth was 2.2m deep, of which a brick sub foundation took up about 0.6m, and on top of which up to three limestone foundation courses were laid.[31] The Black pyramid would appear to have the largest foundation trench, at over 3m deep and a possible 8m wide: maybe the poor quality of the ground gave them some concern?

[31] The Pyramid Complex of Senwosret III at Dahshur, D.Arnold, 2002, page 27-28

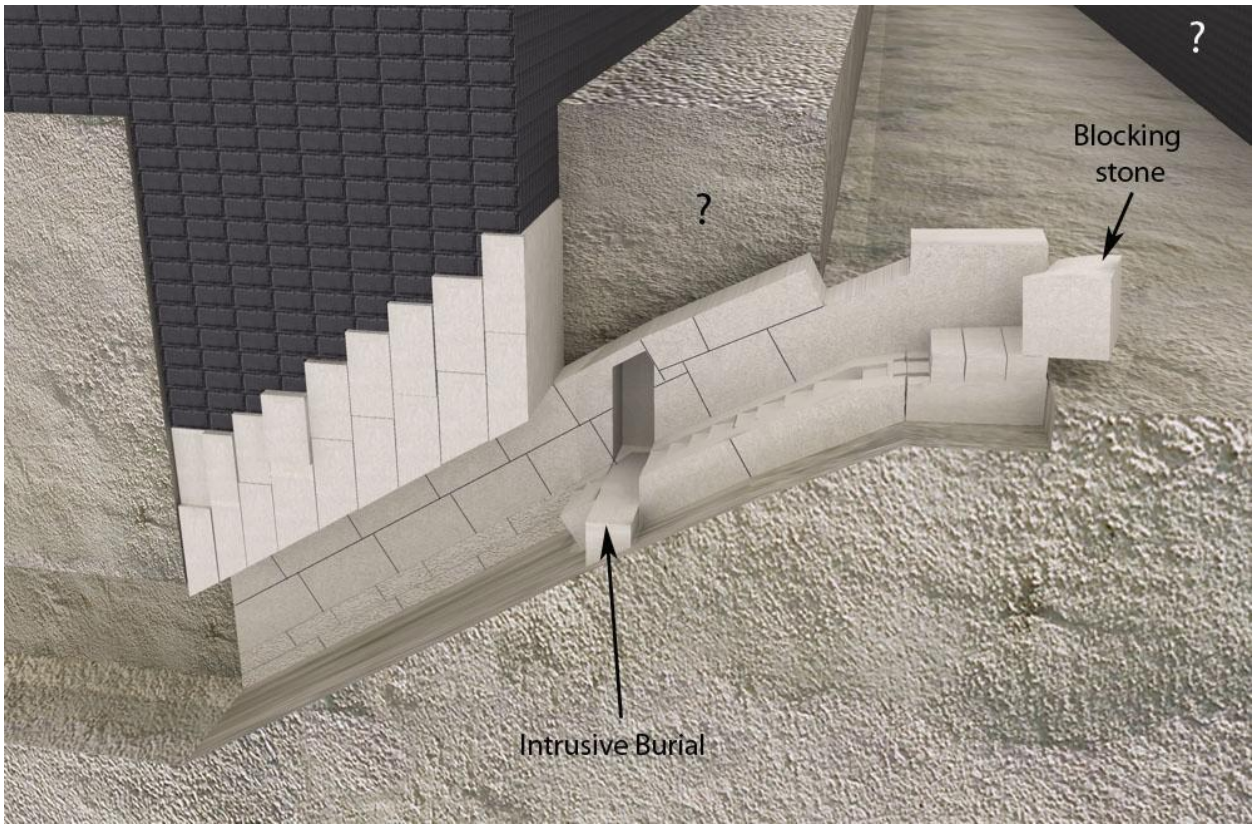


The above reconstruction based on Arnold's plate 43, gives a rough idea on how the east entrance may have looked at the Black pyramid. It is believed that an open trench was created and the stairway built from the bottom; Arnold reports a slight kink in the passage at the top section of the stairs, a possible correction to ensure it exits correctly at its allocated position in the foundation trench.[32] The horizontal passage O2 at the bottom of the stairs was excavated out of the rock; this passage is believed to have been lined with fine limestone, which was subsequently robbed. Arnold would give a height difference between the pyramid base and presumed limestone floor of O2 at some 10.74m. The ceiling slabs covering the stairway were laid vertically and weighed up to 10 tons; the space above the ceiling at its lower end may have been filled with a mix of sand or brick.

The steps were somewhat irregular in size and slightly inclined downwards, treads could vary by 8cm and risers by 3cm; their width was 52cm (1 cubit) and either side a smooth bank some 40cm wide was left. The stairway walls are made in two

[32] Der Pyramidenbezirk des Königs Amenemhet III. In Dahschur. D Arnold, Vol 1, 1987, page 21

courses of 84cm, with the vertical height around 1.90m: average angle of the stairway is 27.5 degrees. Its quality is excellent, Arnold states; *"The joint closure and the surface smoothing are of a perfection that can only be found in the Royal Chamber."*



The above reconstruction gives a rough idea of the current state of O1; a lot of the ceiling beams have been robbed; moreover, the lower part of the stairs have been removed along with practically the whole southern wall of the passage in the same area. Just east of this damaged area we have an intrusive burial; in order to maintain the correct north-south alignment for the body, the stairway was cut down to provide a flat platform and both passage walls had deep niches cut out. The grooves at the entrance had three stones plastered over them, and on top of these rested the jammed blocking stone (I have assumed that these grooves extend under these stones). This damage to the passage allowed Arnold to notice an interesting feature, the wall blocks had been connected to each other with quartzite dowels.

The removed ramps by the intrusive burial platform had been repaired by makeshift stones in order to remove material. The whole area is difficult to

interpret, due to the unknown times that this passage may have been opened and blocked for intrusive burials/ robbing. At the top of the stairway near the ceiling were two small square holes in each side wall, one still retained a piece of wood; Arnold would suggest a temporary wooden door in this location.

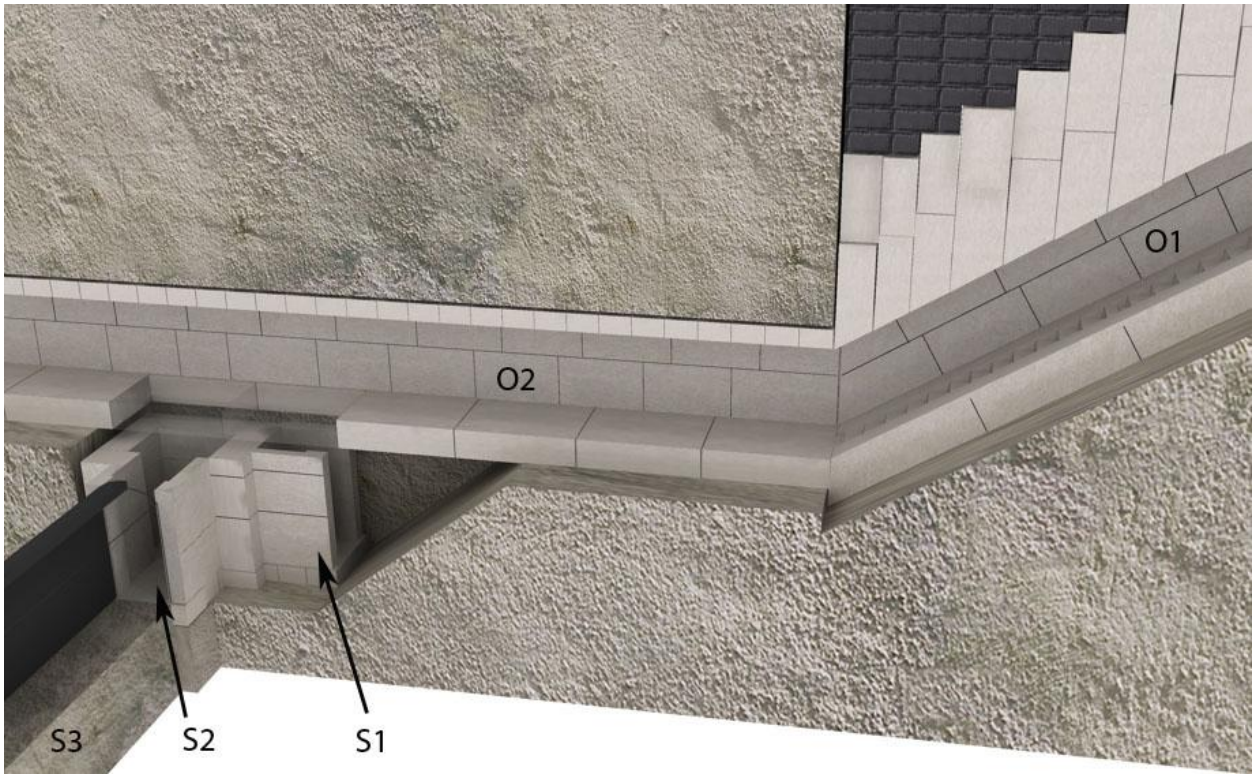
Passage O2

This passage had a length of some 22.5m, however, its width and height is unknown as it is believed that its entire limestone lining has been removed by robbers. Littered on the floor were fragments of limestone which had been covered with tafl from a degrading ceiling. Today this rock cut passage is covered and shored up by wooden beams, so it is no longer visible. The passage leads directly to chamber O3, Arnold would notice that there was a level difference from the bottom of the entrance stairway and the floor level of chamber O3 of 84cm, however, it was not possible to determine if the passage had a slight downward slope to O3 or if steps were made into O3.[33] For the passage to maintain the same width as the stairway, Arnold would suggest wall cladding from 25-50cm thick.

At around 4.9m from the start of the passage a ramp of some 27 degrees was found in the floor; this ramp would terminate about 2.8m below O2's floor, and allow access to the south tomb, along with assisting in the transport of heavy masonry. The ramp was found to be filled with brick and it is thought that this in turn would be concealed by the masonry floor of O2.

At the bottom of this ramp in a brick lined construction pit was found the small chambers S1 & S2. S1 had been robbed of some of its stone, but what was left was polished; this is in contrast to S2 whose walls were still left in a rough state, with broad chisel marks visible: only its entrance by S3 was polished. Arnold reports evidence on the upper wall stones of S2 that suggested a cover plate covered the chamber, on which presumably the floor stones of O2 would rest.[34]

[33] Ibid, page 23
[34] Ibid, page 54



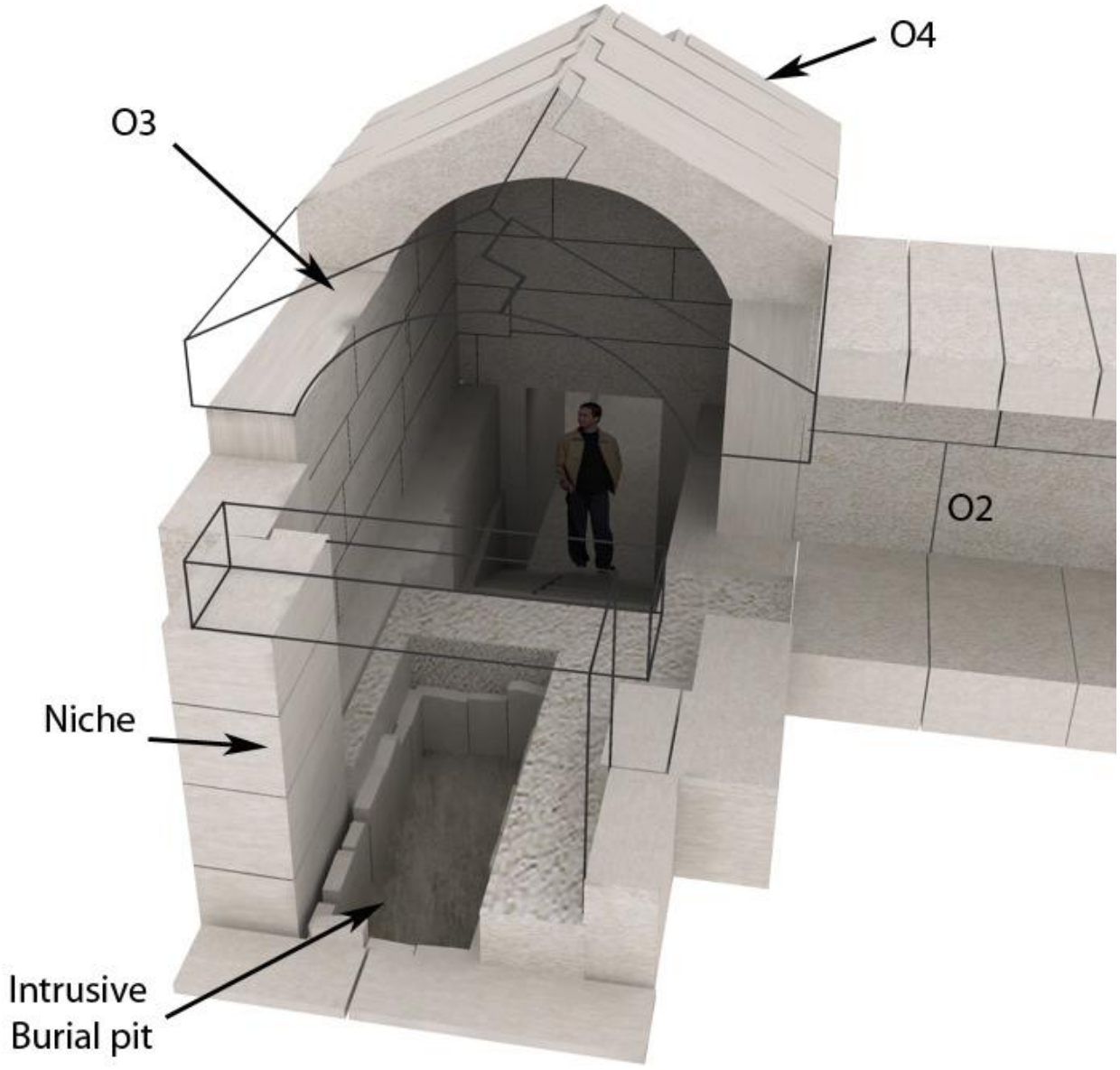
The above reconstruction shows the location of S1 & S2 under the passage of O2 (I have omitted the brick filling of the ramp); the function of these chambers, like so many in the South Tomb is not known with any certainty. Some thirteen of these small stone lined chambers inhabited the South Tomb, all connected by a considerable passage system, which was lined with brick, and with arched roofs.

Chambers O3 & O4

The reconstruction of chamber O3 is problematic, due to the robbing of stone; even the entrance location from O2 is uncertain, due to stone robbing, which has left some of the vaulted ceiling beams unsupported. From the surviving east wall masonry and a requirement that a stone lintel once supported the ceiling stones Arnold suggested a low entrance doorway into O3 of 1.32m.[35] The main section of O3 is given as 4.08m long, 2.24m wide and 2.58m high to ceiling apex; this was covered by a series of vaulted stones: to the south of this section a small niche, which would be covered by flat beams exists, whose height is hard to determine; Arnold would suggest either 1.02 or 1.50m high, the niche was 1.50m wide and

[35] Ibid, page 24

0.95 deep.[36] The uncertainty in the height is due to the missing floor in this area, caused by an intrusive burial pit some 95cm deep, which was lined with stone slabs.



The above reconstruction gives a rough idea of layout; in the floor of O3 the remains of a ramp with steps down its middle, lead down to chamber O4. The staircase appears to not extend to the floor level of O3, but stop at a platform some

[36] Ibid, page 23

95cm lower, which coincides with two ledges left in the side walls: the ledges may have helped to hold masonry and conceal the presence of the lower chamber O4.

Image courtesy of Colin Reader

In the above image we can see the stairway leading down to O4; the uncertain entrance on the right has been repaired to support the ceiling slabs. The narrow ledges either side of the stairs are clearly visible.

I have highlighted the area above the steps which is determined by the ledges and platform at the top of the steps; by scale rule from Arnold's plate 45 this area is 2m long 1.55m wide and 0.95m deep. How this area was concealed by masonry is unknown, but it could have been as little as two blocks each of 1 x 1.55 x 0.95m.

A strange feature noticed by Arnold is the traces of older steps on the east wall of the stairway, which appear to be at a higher level than the existing steps. There are no traces on the opposing wall, so it's not known if these earlier steps extended the full width of the stairway: it might have been the case that these steps only extended a short distance, to aid workman transit, whilst the rest was a ramp. Given the large number of chambers and passages that were lined with masonry, a considerable amount of heavy traffic is to be expected through this area; was a rough utilitarian ramp provided originally that was subsequently cut down?

The Tympana on both south walls of O3&O4 have been breached and this allowed Arnold to observe that the ceiling slabs abut against each other in a zigzag fashion. There is no mention of construction shafts being visible through these breaches, so it appears that all construction was done within the hollowed out tafl (no fewer than 17 chambers have this style of roof).

The intrusive burial contained a few bones (male) and fragments of the funerary assemblage.[37] Next to the burial pit, in the south east corner of the niche, there was a depression, believed to be for canopics (I have not shown this in my reconstruction). Today the intrusive pit is no longer visible, it has been filled up, and images suggest that the niches floor level has been restored to the same level as O3. It might be possible that the niche along with O3 were a ruse to deflect robbers from searching further; a canopic box may have been placed in the niche and a makeshift burial placed in O3.

Also found inside the niche were two large holes, roughly cut, which penetrated through the entire wall block; Arnold believed that it may have held a 20cm thick beam, which could have been used to lower or raise heavy loads up the stairway.[38] Arnold also noticed traces of gypsum on the surfaces of O3, suggesting that the chamber was filled with limestone blocks.

Chamber O4

Chamber O4 varies slightly in size, being 3.2m long, 2.28m wide, and 2.70- 2.75m high (O3 = 4.08 x 2.24 x 2.58m); so shorter in length but a higher ceiling. This vaulted ceiling is the same as O3, and consists of 9 pairs of beams, whilst O3 contained 11 pairs. Stone robbers appear to have removed the south wall, and removed most of the southernmost pair of beams. In the floor a sarcophagus pit some 23cm deep was made, measuring 1.07-1.08m wide, and 2.58 – 2.61m long; it terminated at the north wall: Arnold would note traces on the north wall, which suggested that the sarcophagus had a height of at least 1.20m above the pavement.[39]

No trace of this sarcophagus survived and Arnold suggested that it may have been removed for reuse. The size of the recess, assuming the sarcophagus matched its size, is a concern as to its introduction into the chamber[40]. Its location effectively

[37] Ibid, page 24
[38] Ibid, page 25
[39] Ibid, page 26
[40] Ibid, page 26

blocks access to the corridor O5 and preventing any funerary procession to the Kings chamber, so it would appear not to be an original feature. Its length at a possible 2.58m is wider than O3 and therefore any sarcophagus of this size could not be introduced via a completed O2/O3 junction; there is simply no space to turn the sarcophagus. If the sarcophagus and recess in O4 were original items, then a sizeable portion of the east wall in O3 were O2 meets would have to be omitted in order to allow the sarcophagus to pass; which in turn would delay ceiling construction in this area; but how likely is this scenario? If the king still intended using his pyramid, he would hardly sanction a sarcophagus to be introduced into O4 and blocking his own funerary procession. It could be argued that the king had already decided to abandon his pyramid in favour of Hawara, and sanctioned its introduction, but why not maintain the Black pyramid as a backup during the lengthy build of the Hawara pyramid and prohibit any burial into O4 that blocked access to his own chamber?

In a construction such as we see under the Black pyramid, it is likely that chambers were constructed from the inside out; stone lined passages are about 1m wide, whilst unlined practically doubles the width. It's unlikely large masonry used in the numerous chamber constructions was brought down finished passages, risking damage; instead, it is more likely that the chambers were constructed first, and then working back they would line the passage. Given the materials that would have to transit through O3&O4, these chambers may have been late in the construction sequence; likewise passage O2, would this be lined until the completion of O3? O2 is entirely devoid of any surviving masonry, but can we pose the question, was it ever lined and completed? The entrance stairway O1 was completed, but this is an exception, as it is built in an open trench and had to be completed early, otherwise it would interfere with construction of the superstructure (in the western entrance the entrance stairway was completed in fine limestone, though the passage leading from the bottom of the stairway was lined with brick).

An intrusive burial might be a simpler explanation at an unknown date; the structure may have been opened/violated several times even before its introduction. O4 would be a logical choice for an intrusive burial such as this; as the king did not use the pyramid, it is likely that the stairway between O3&O4 remained opened for easy access. The installation would mean damage being made to the entrance of O3 to allow the insertion of the sarcophagus; afterwards the stairway would be concealed, and possibly chamber O3 filled with limestone blocks.

The filling of so many chambers and passages with limestone blocks and brick is confusing, and not helped by De Morgan's scant report. For example, Arnold states

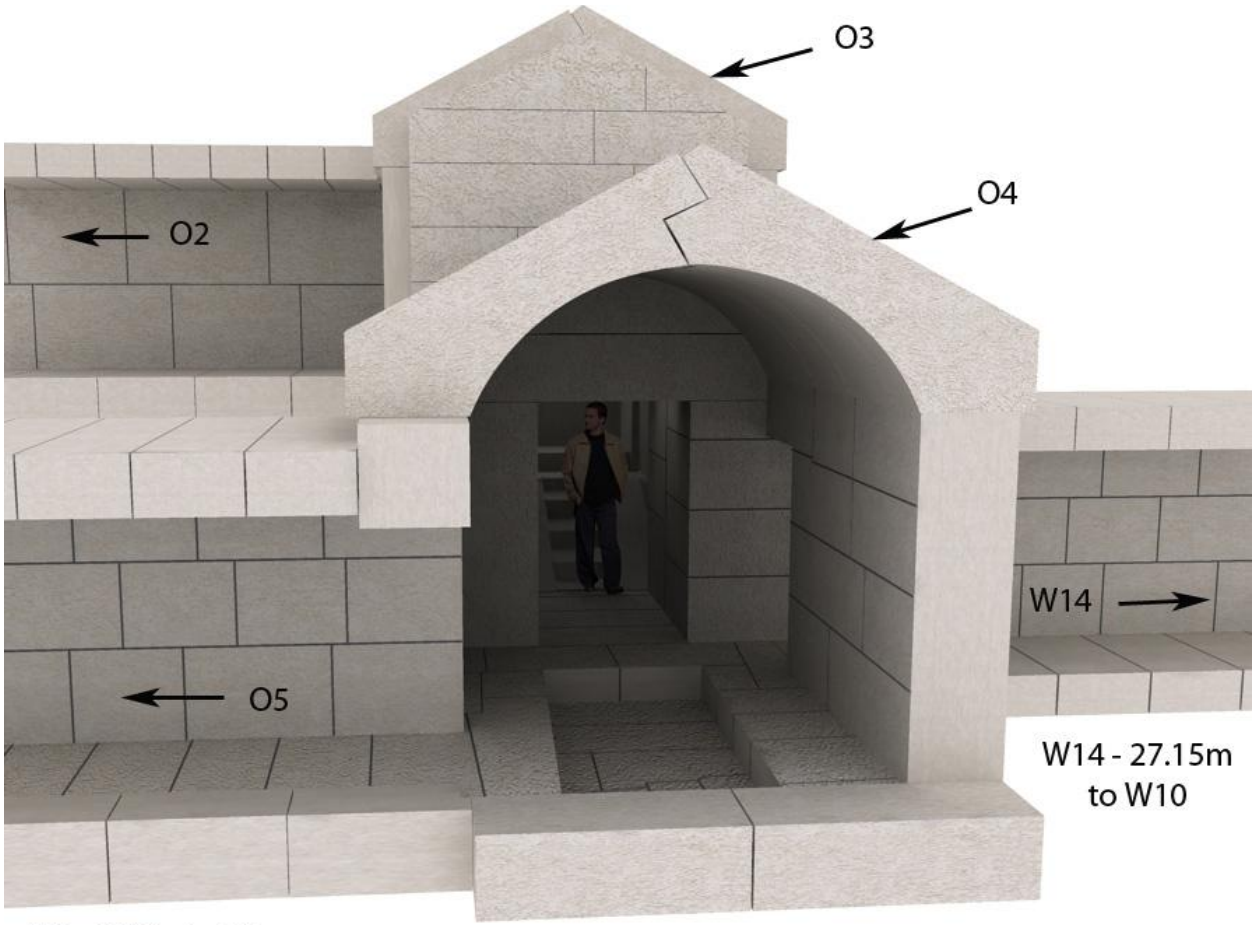
that apart from a large hole made in the north wall of O4, possibly made by violators or stone robbers; there were no traces on the walls that suggested that the chamber was filled with brick or limestone: only the ceiling bore traces of lamp soot.[41] In contrast, De Morgan's report, which labels O3 as XVI, and O4 as XV states;

"Formerly, rooms I, II and III (O14, O15&O16) *were filled with freestone, rooms IV, V, VI, VII, VIII, IX, X, XI, XII, XIII,* ***XIV*** *and* ***XV***[42] *were filled with mud bricks, the corridors had been left empty."*[43]

The above statement is somewhat ambiguous; indeed, on the same page he would state; *"A peculiar fact is that most of the rooms, filled with bricks, were not opened by the spoilers".* The clearance of all this debris and brick took from March 19 to April 25; Arnold in his excavations clearly notes the presence of brick filling in many chambers, as they left an imprint on the chamber walls, however, no such traces were found on the walls of O4. Does this mean that De Morgan assumed that O4 was filled with brick, like so many of the other chambers? Alternatively, did he witness O4 filled with brick, and if so, does this suggest that O4 was filled with brick after the removal of the sarcophagus? De Morgan's failure to properly record what he observed is a major obstacle in trying to understand the history of this structure.

Two passages connect to O4, W14 heads west to connect with the queen's apartments, whilst in the east wall a passage O5 heads east to chamber O6. The passage W14 is quite a narrow passage; it was stone lined and had a width of only 60cm, though a comfortable height of 1.71m, Arnold believed that this passage was not part of the original plan, but was added later after the start of the construction.[44] The opening for this passage in the west wall was made when the wall was already completed, necessitating processing of the effected masonry; a wooden door was planned as an upper pivot bearing was found, though plaster traces on the roughened sides of the doorway suggest that it was sealed with plates of stone some 30cm thick, which were probably removed by robbers. In contrast Passage O5 is of similar height 1.70m, but a more comfortable 1.06m wide.

[41] Ibid, page 25
[42] There appears to be a typo on De Morgan's plate XVII, were XIV appears to be XVI on the plan
[43] Fouilles A Dahchour, 1903, page 105
[44] Der Pyramidenbezirk des Königs Amenemhet III. In Dahschur. D Arnold, Vol 1, 1987, page 52



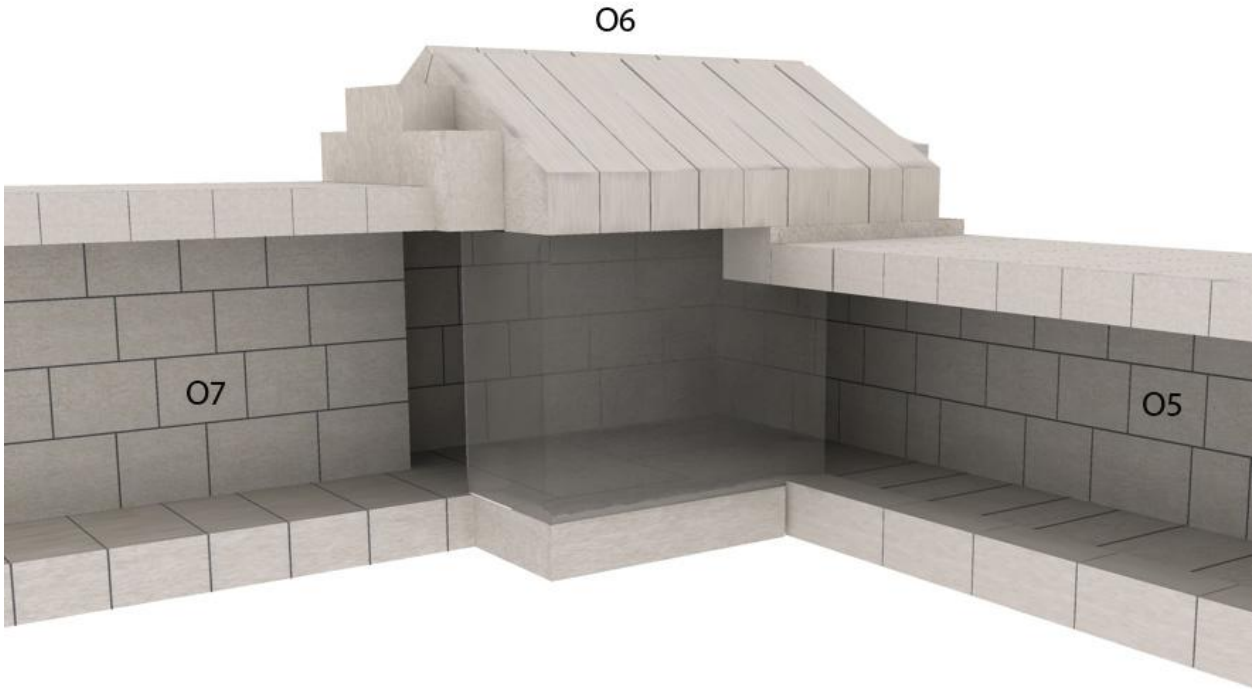
The above reconstruction, looking south, gives a rough idea of the layout of O4 and its connecting passages; W14 exits in the south-west corner, whilst O5 exits in the north-east corner. The floor level of O4 is about 13.42m below pyramid base[45], this compares to the kings chamber O16 whose floor level is some 13.87m below base. At the bottom of the stairway between O3&O4 we have a short passage some 2m long, 1.1m wide and 1.8m high (by scale rule from Arnolds plate 45: the bottom of the stairs is vertically aligned with the north wall of O3). The width of this passage is quite similar to the sarcophagus recess, so clearance would be minimal. Today the sarcophagus recess is filled in, and placed in the north-west corner of the chamber is the reconstructed canopic chest of Queen Aat.

[45] The levels data relate to a survey point northeast of the valley temple, as no information on heights above sea level could be obtained. Arnold gives the end of O1 as 10.74m below base; the base of O1 he gives as -0.58 below zero, whilst the pavement of O4 is given as -3.26: the difference between the two readings added to 10.74 give a depth of 13.4m below base for O4. Mark Lehner in his Complete Pyramids book, gives the pyramid as 33m above sea level.

Passage O5

Passage O5 heads back east for some 8.475m and enters chamber O6 (this rather precise measure by Arnold, appears at odds with Arnold's plate 46 and Faltplan 1, were by scale rule, the length from the east wall of O4 to the west wall of O6 is around 9.5m)[46]; this chamber acts as a turning chamber (O3&O4 play a similar role) in allowing large items turning space: this chamber connects to a long passage running north, from which most chambers branch off. The floor of the passage consists of transverse slabs on which the walls are built, of which there are three courses, which are covered with flat ceiling beams. Arnold reports that a long east – west crack was visible in the ceiling, and in some cases had sank markedly; De Morgan had to shore up the passage in places with wooden beams. Arnold noted a strange feature in the passage walls, in that some 17 out of a total of 28 butt joints on the north side had been patched; a similar observation was also made in passage O13, which leads to the Kings chamber.[47]

Chamber O6 & passage O7



[46] Ibid, page 27, plate 46 and Faltplan 1
[47] Ibid, page 26

Chamber O6 is given as 3.52m long, 2.25 wide, and 2.76m high; similar to O4 but longer. Arnold observed a line marked on the chamber floor that denoted the chamber axis; similar lines were observed in other chambers: also observed was plaster repairs to level the floor, when the wall foundations sunk. The passage floors support their walls, whilst in the chambers the walls tend to rest on their own foundation stones, with the paving stones free standing on the tafl; such that when the body of the chamber sunk into the deformable tafl, the paving stones were left behind often causing a noticeable step in the floors.

Passage O7 exits in the north wall of O6, and here a noticeable increase in passage height is apparent; whilst O5 had a height of some 1.7m, consisting of three courses, O7 is increased to 4 courses and a height of 2.03m; while its width at 1.10m is similar to O5 (probably an intended 4 x 2 cubits). This elevated height is maintained along all the north orientated passages, i.e, O7, O11, O17 & O21. It is interesting to note that the width of the majority of chambers that make up the kings apartments, with vaulted ceilings have a very similar width; this allows for a largely standardized production run for the numerous ceiling beams that would be required (the kings chamber is wider by about 52cm (1 cubit); whilst its antechamber is narrower at around 2.09m (4 cubits width): the remaining chambers appear to have a width of 2.25m (4 cubits, 2 palms).

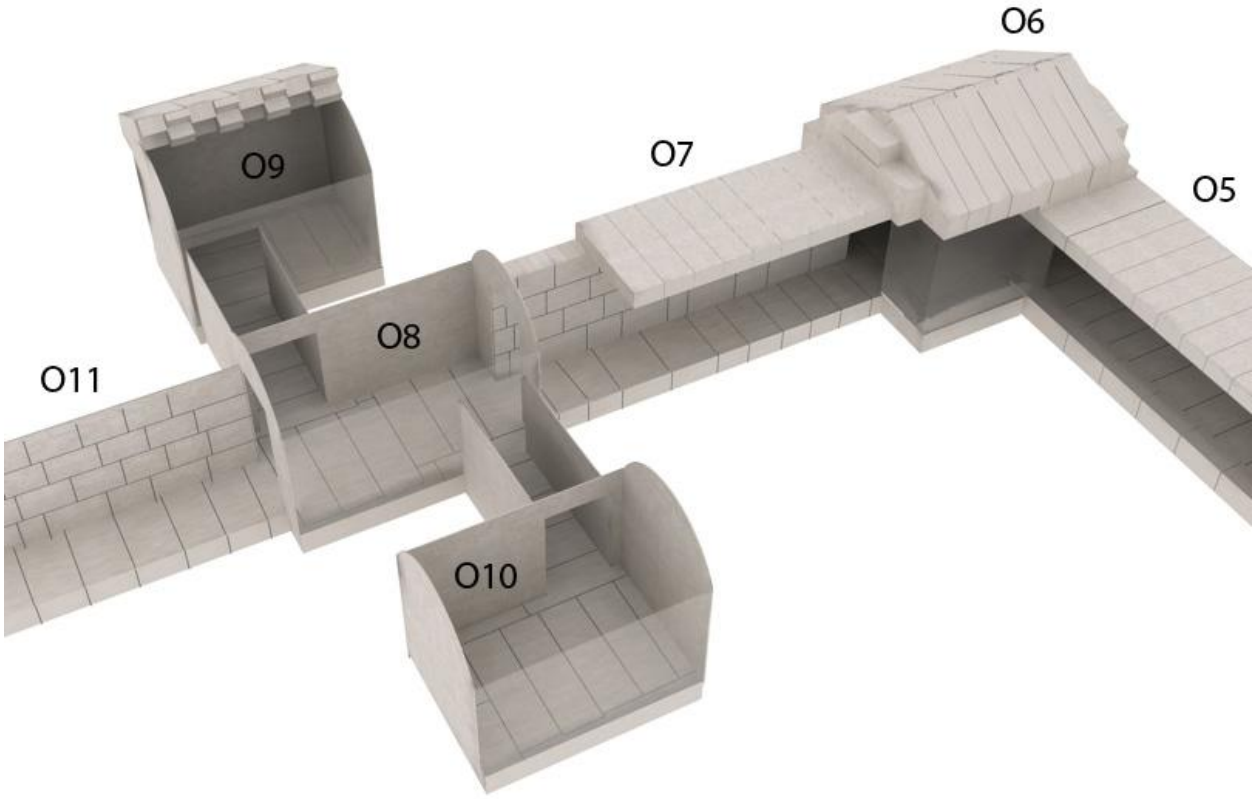
Chamber heights all appear fairly uniform at a possible intended 5 cubits 2 palms (2.77m), only O3 is noticeably different at a low 2.58m. The consistency in width and heights is not matched in chamber lengths, which vary a lot.

Like chamber O6 there is evidence from the walls that passage O7 was filled with brick to the ceiling.

Chambers O8, O9 & O10

O7 runs north for some 6.67m were it enters into O8; this chamber is 2.25 wide, 3.89 long and 2.76m high. This space is basically a widening of the passage, which allows large items a turning radius so that they can be introduced into chambers O9 & O10, and like those chambers it has a vaulted roof. Branching off O8 are two short passages at opposite ends of the chamber, which lead to the side chambers O9 & O10. This staggering of the entrances was possibly a decision not to concentrate too much structural weakness at one end of the chamber; however,

though replicated in chambers O18, O19 & O20, it was omitted in the final set of three chambers O22, O23 & O24 (see plan, page 7).



The schematic view above, with ceilings removed, gives an idea of chamber layout; in the west wall of O8 a passage leads to O10, while a similar passage in the east wall leads to O9. The dimensions of all three chambers closely mirror each other apart from length: O8 is 3.89m, O9 is 3.30m, and O10 being 3.20m.[48] The short passages at some 1.10m wide appear to mirror the other passages, a possible intended 2 cubits; whilst their height is around 1.70m and 2.70m long.[49] The function of these side chambers is not known, they total six O9, O10, O19, O20, O23 & O24, and like so much of the substructure they show evidence of having been filled with brick.

[48] Ibid, page 28-29. There is slight variability to measures; for simplicity I have taken the highest measure.
[49] Possible typo in Arnold's work, page 29, he gives O10 passage as 1.585m long, but his Flatplan 1 shows this passage to be the same as O9's. Passage height is also at odds, fig 10, page 28 suggests a lower height of 1.6m, which is also confirmed by plate 46.

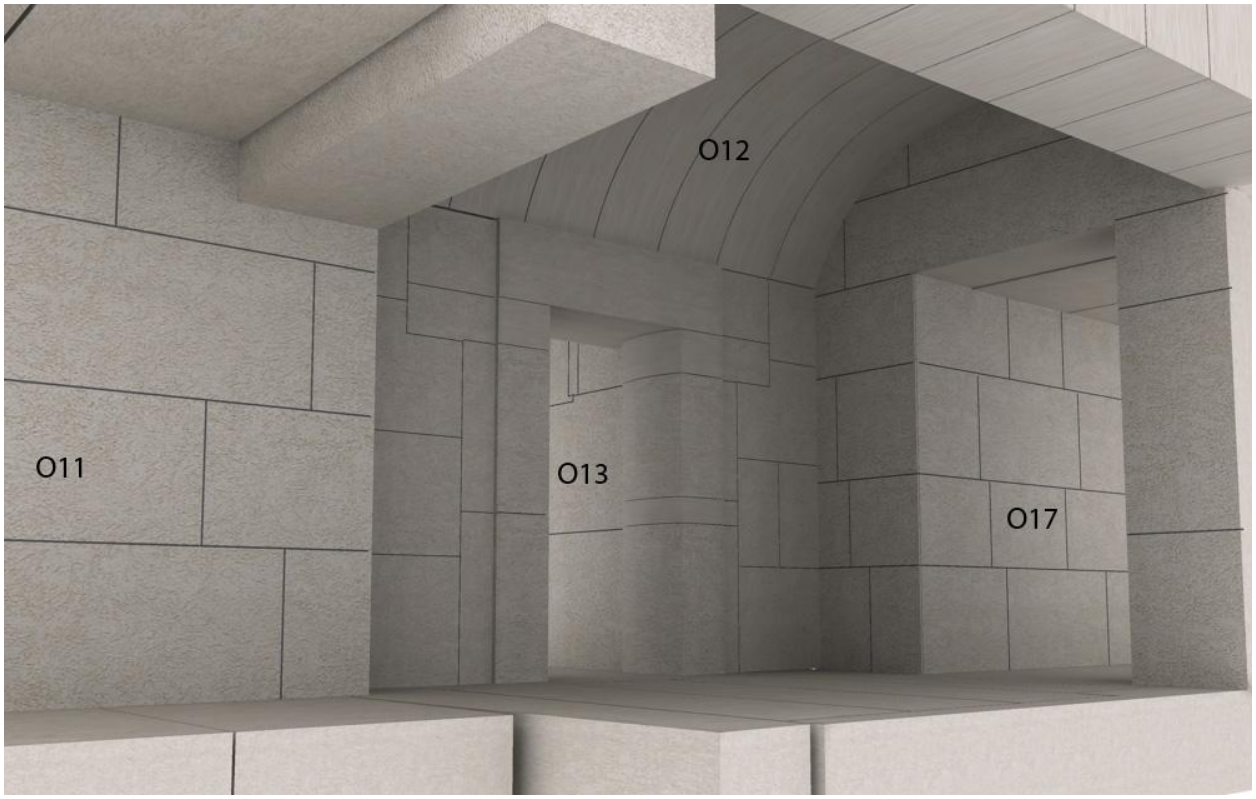
Passage O11

Image courtesy of Colin Reader

In the above image we are looking along O11 from O8; at the end of passage we can see the lintel of O12 which reduces the passage height here by some 26cm. The passage height varies from 2.03m at south end to 2.09 at north end: both passages O7 & O11appear to exhibit a slight downward slope to O12; we have a

difference in floor levels between the floors of O6 and O8 of 24cm, and from O8 to O12 a further drop of 42cm.[50] O11 is given as some 12.25m long and 1.10m wide, and there is evidence that this passage was also filled with brick.

The Kings Chamber O16, O15, O14, O13, & O12



In the above reconstruction we are looking into O12; the long passage O11 ends by the lintel which reduces ceiling height to around 1.83m; the entrance to passage O17 regains the height to about 2.08m. O12 is a turning chamber that allows sizeable items to travel down passage O13, which leads to the king's burial chamber: O12 dimensionally is different to the preceding chambers; its width is 2.19m, length 2.98m, and height 3.18m[51], and according to Arnold's Faltplan 1 the doorways of O11 & O17 are not aligned with the axis of the chamber, but shifted to the east.[52]

[50] Ibid, plate 46
[51] This height conflicts with Arnold's plate 46 & 47 which suggest a height closer to 2.8m
[52] By scale rule, the O11 doorway is about 70cm from west wall of O12, and 40cm from east wall.

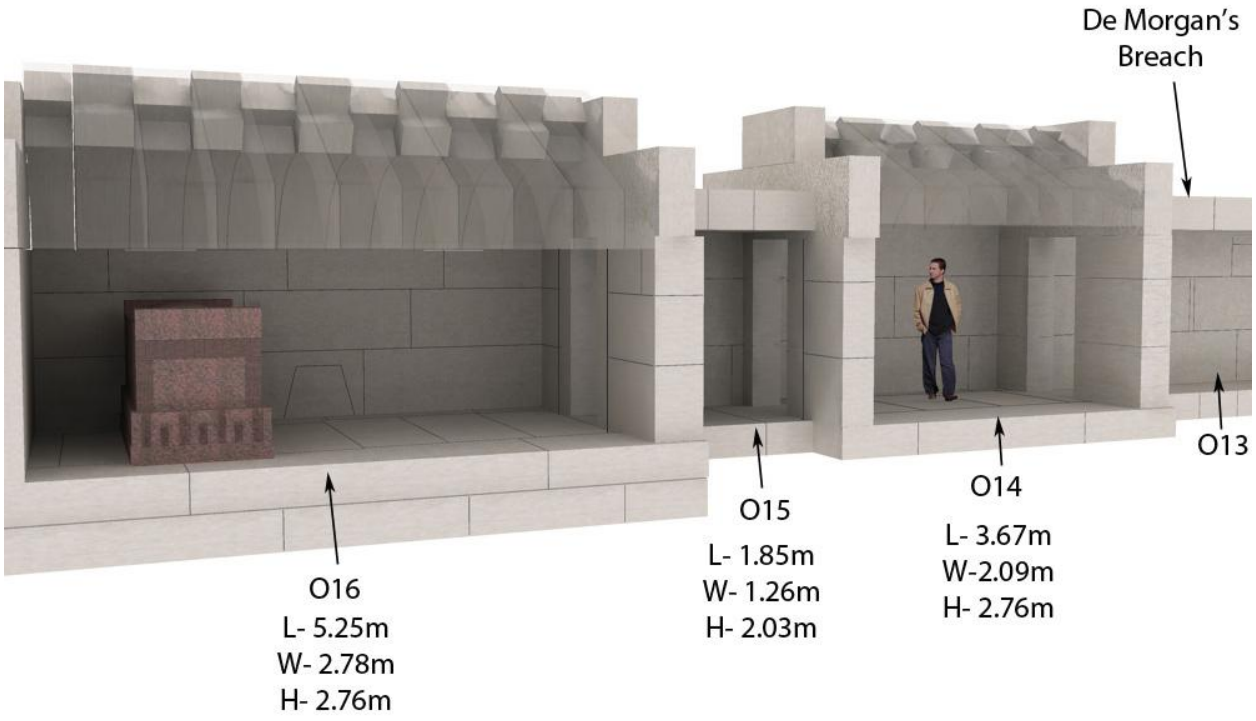
The opening to passage O13 has curved doorposts similar to those found in the northern brick pyramid[53], along with a projection around the doorway up to 3cm deep and 29.5cm wide. The doorway to O13 is a narrow76.5cm at the bottom to 75cm at the top, and its height by scale rule about 1.75m.

Beyond the doorway the passage O13 widens to 0.97m and increases in height to 2.07 – 2.10m; this passage continues for some 8.85m and enters into antechamber O14. Though O13 is of a similar size to the previous passages, it is constructed of just three courses. The strange feature of patch stones found in the other east-west passage O5 of very similar length is also to be found in O13; here Arnold reports that 9 of the 17 butt joints required narrow vertical patch stones, some 7-8cm wide and 10-12cm deep.[54] Arnold was unable to determine the reason why these two passages required such repairs.

At the west end of O13, De Morgan's breach in the ceiling allowed him access to the substructure; on the floor below this Arnold still found some of the original brick filling in situ.

At the end of O13 we are greeted by a similar pair of curved doorposts as we enter into the antechamber O14; the width of this entrance appears to mirror the other end, and the height is slightly reduced due to a lintel. O14 is narrower in width than O12, being around 2.09m (4 cubits?), whilst its length is 3.67m (7 cubits?)[55] In this chamber we have quite large floor slabs, detached from the foundation slabs on which the walls sit; the resulting settling of the wall foundations, have left steps in the paving that was suitably compensated with gypsum; which made it difficult for Arnold to measure the floor slabs. In the west wall of O14 a narrow doorway, similar in width to the previous, leads into a short passage O15 that connects the antechamber to the kings burial chamber; it is 1.85m long and 1.26m wide, and is spanned by three flat roofing beams: this leads into the kings burial chamber, the largest of all the chambers. The arrangement is quite similar to that by his predecessor in the northern brick pyramid.

[53] See my guide on The Pyramid Complex of Senwosret III
[54] Ibid, page 29
[55]



The above view gives a rough idea of chamber layout; though the layout has similarities with the northern brick pyramid, the burial chamber differs in not being constructed out of granite. The burial chamber O16 has some strange features; probably the strangest is the presence of trapezoidal plates in front of the sarcophagus on each wall some 11-12cm thick, and of unknown function. Also on the walls are two similarly deep square holes, around 14cm square, and about 1.06-1.09m (2 cubits?) above the floor: similar square holes are to be found in the queens chamber in the northern brick pyramid: Arnold suggested that they may have been linked to the closing of the sarcophagus.

The sarcophagus, made from red granite has a wide base of some 1.15m, a length of 2.61m, and a height of 1.32m. The prominent base, like his predecessor's mimics Djoser's enclosure wall; though extra detail is given in the form of reed matting that frames the edges of the box and a pair of wadjet eyes that face east.

Image courtesy of Colin Reader

The above image shows some of the features in the Kings chamber; the trapezoidal plate in the north wall is fairly intact whilst the southern has been breached, at some unknown time. The square hole is also visible in the north wall; its southern counterpart can just be made out, with its blanking plate intact. At some point in its history a strip of paving has been removed by searchers; this allows us to see that the Kings chamber had two foundation courses, with the lower course being longitudinal.[56]

[56] Ibid, page 31

Image courtesy of Colin Reader

In the above image, one can just make out the eyes on the north end of the box; also we can more clearly make out the protruding entrance gate in the plinth. Arnold reports that as the walls and their foundations sunk, this left the ends of the sarcophagus protruding somewhat over these foundation stones; this left a gap that was filled with bits of stone and plaster, which was painted pink in an attempt to match the sarcophagus. Further, as gypsum traces were found on the chamber walls, it suggests that this chamber was blocked with stone blocks; so the plaster repair had to have been done before the blocking.[57]

The nature of this stone blocking is not known, De Morgan, merely states; *"It was formerly filled with cut stones on which were marks drawn in black"*[58], but it may have resembled the stone blocking which still survives in the queen's chambers. Arnold would find some stone blocks in O14 which he thought may have been left there by De Morgan from clearance of O16; he does not mention the condition of the walls in O14, but notes no gypsum in O15, but dirt on the walls, which might

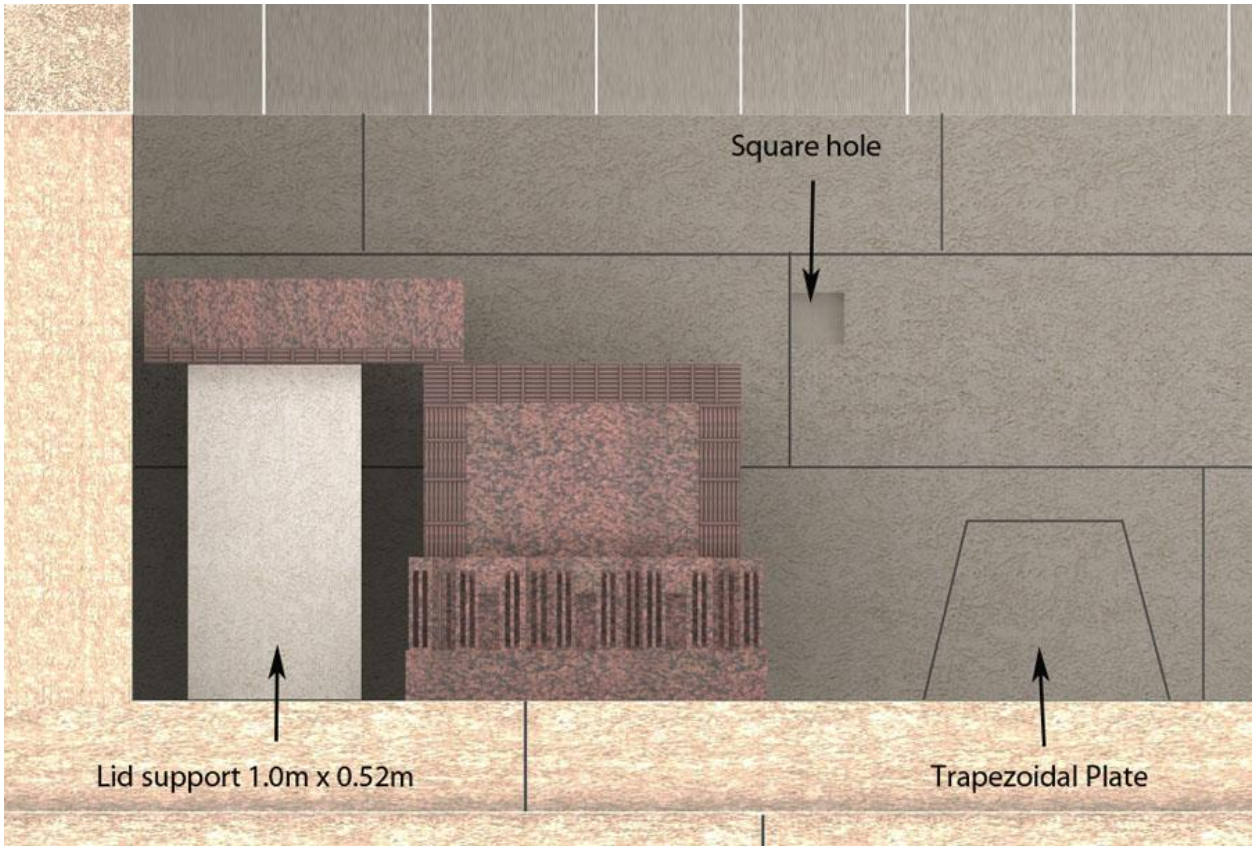
[57] Ibid, page 31
[58] Fouilles A Dahchour, 1903, page 104

suggest that O14 & O15 were filled with brick: however, De Morgan clearly states that chambers I, II, III (O16, O15, O14) were filled with stone.[59] It might be the case that robbers removed stone during their searches of the burial chamber and dumped them in O14 & O15, and giving De Morgan the impression that these chambers were likewise filled with stone: we may never know as De Morgan provides us with no detailed records.

The plaster repairs at the overhanging ends of the sarcophagus seem to suggest that this was the original intended location for the sarcophagus, and that they were made before the decision was taken to fill the chamber full of limestone blocks; as it would seem illogical to effect repairs that would not be seen, by placing blocks against the sarcophagus. All this blocking of the chambers and passages appears to be an attempt to shore up a substructure that was clearly showing signs of stress, and as De Morgan had noted, chambers were filled with brick, which when emptied were found to be devoid of any artifacts. Clearly then a lot of this blocking was not security related to protect artifacts, but more to protect the structure of the chamber; though the blocking of passages could be construed as serving both functions, security to prevent access to the chambers and supporting the structural integrity of the passage.

That the sarcophagus location in the chamber appears to be original, might be confirmed by an observation by Arnold who noticed a strip of wall 1.0m high by .52m wide, which was not smoothed at the west end of the south wall: he would suggest that a stone support may have stood here to support the lid, which would be stored behind the sarcophagus.[60] The height of this rough patch of wall closely corresponds to the height of the box. It is possible that two such support stones for the lid existed, each end of the lid.

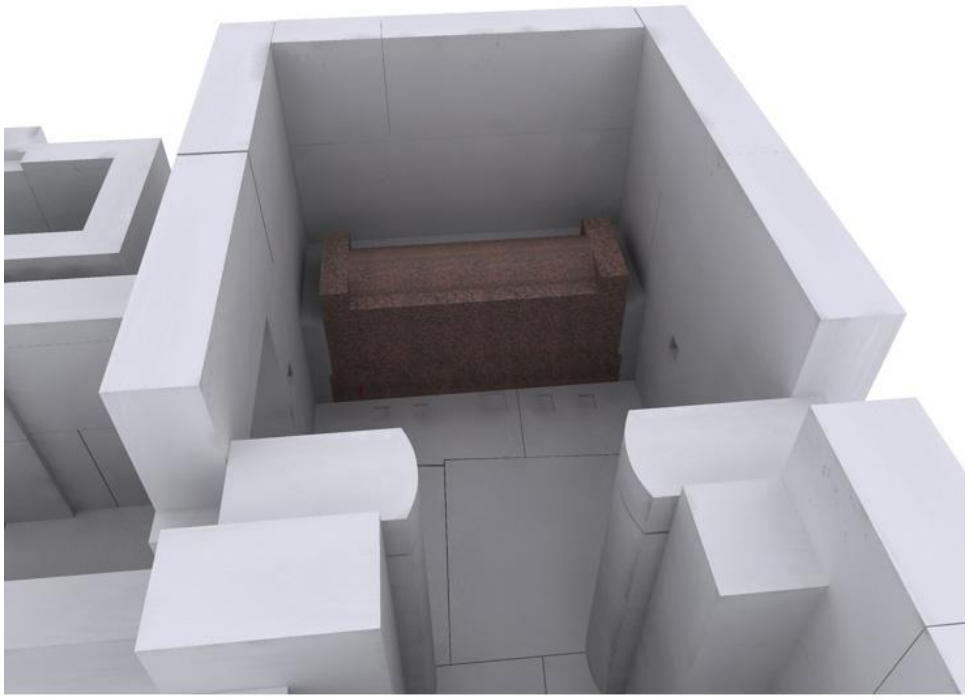
[59] Ibid, page 105
[60] Der Pyramidenbezirk des Königs Amenemhet III. In Dahschur. D Arnold, Vol 1, 1987, page 32

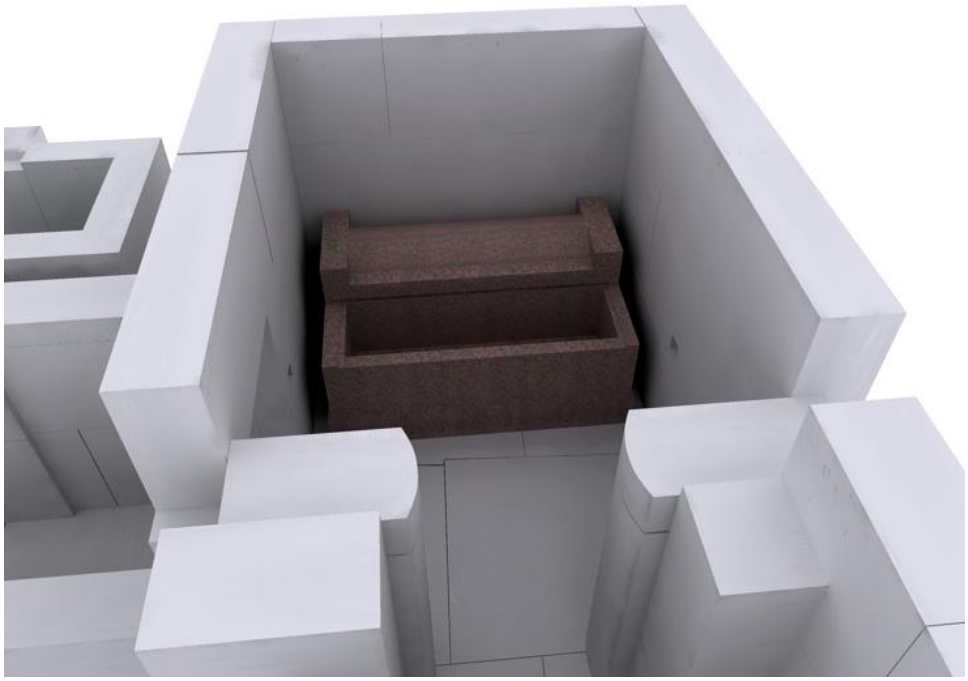


The above reconstruction gives an idea of how a stored lid may have looked, and it's interesting to note the positioning of the square hole in relation to the lid: Arnold would state; *"They were certainly used to insert beams when closing the sarcophagus"*[61]. It is interesting to compare the sarcophagi positioning in the Black pyramid with that of his predecessor in the Northern brick pyramid; in the Black pyramid the sarcophagi are positioned, like above, a distance from the end wall, whereas in the Northern Brick pyramid, they are closely set to the end walls with thin limestone packing filling any space between the sarcophagus and the walls. In my guide on Senwosret III's pyramid I suggested that the pyramid had been violated and that during restoration/repurposing works that the sarcophagi may have been moved. On the next page we are looking into Queen Weret's tomb under the Northern Brick pyramid; the upper image is how the sarcophagus was found, with the front edge of the lid some distance from the square holes in the walls. In the bottom image I have moved the sarcophagus forward, such that the lid is stored on limestone supports, as per the image above. This experiment leaves us with a sarcophagus location more similar to that in the Black pyramid, and with the

[61] Ibid, page32

square holes at a very similar distance to the sarcophagus lid. It also positions the sarcophagus over the strange sockets, which were found on the floor: similar sockets were found in the floor of Senwosret's chamber, and here I suggested that their function was to fix the sarcophagus in its position.[62]





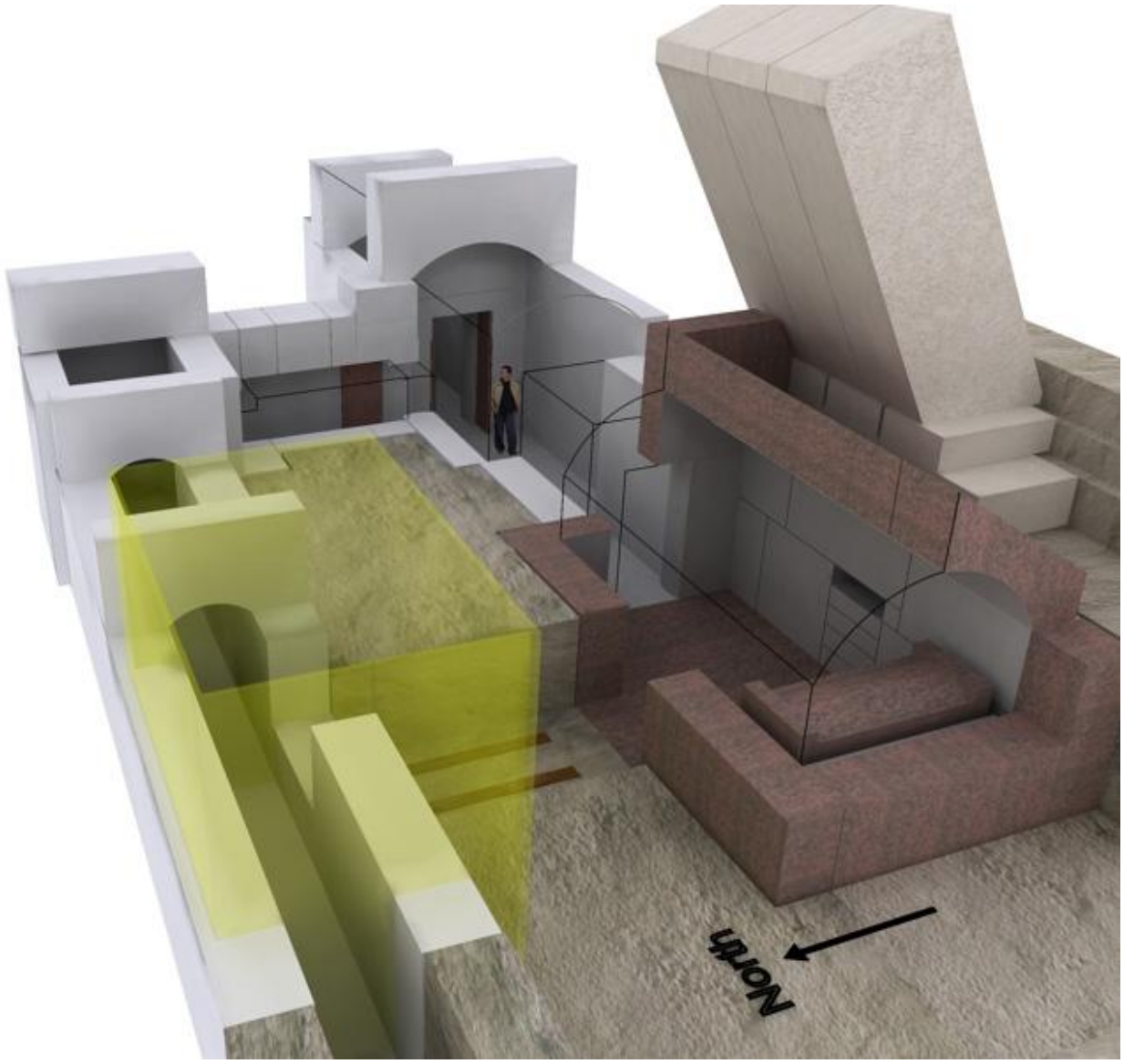
[62] See , The Pyramid Complex of Senwosret III, A layman's guide; available on Academia.edu

The next item to look at is the trapezoidal plates and what their function could have been? Arnold would suggest that, *"Possibly they covered a recess in which beams for the transport of the sarcophagus or the like were embedded"*[63]. They are certainly strange features and the only alternative suggestion I can make, is that they are possibly related to the introduction of the sarcophagus. The question is how and when was the sarcophagus introduced into the chamber?

In the Northern brick pyramid, the question is easily answered, as we have a clear construction shaft and an opening in the wall of the kings chamber, which allowed the introduction of the sarcophagus; however, no such opening is apparent in the Black pyramids chamber. Arnold would suggest construction shafts for the introduction of sarcophagi in the Black pyramid, though none have been found. The sarcophagus at some 1.15m wide cannot traverse the stone lined passage system, which is narrower, however, it could traverse an unlined passage, and as they probably lined these chambers and passages from the inside out, I feel it is a possibility that no construction shaft was needed for the introduction of the king's sarcophagus.

The sarcophagus is a sizeable item, which could get in the way of chamber construction and the fine dressing of the limestone, so it might be beneficial to store it outside of the chamber, until most of this work had been done. The doorposts of O15 according to Arnold's plate 47 and plate 14a are singular limestone pillars, which could have been fitted at anytime: this means that the sarcophagus could have been stored in the space for O14, and after O16 was dressed the sarcophagus could be introduced by O15, which is 1.26m wide, and then afterwards the door posts would be installed reducing the entrance to around 75cm. In this scenario the sarcophagus is brought in lengthwise, however, it requires to be turned 90 degrees, and here we have a problem: the sarcophagus is some 2.61m long by 1.15m wide, and this means that its diagonal is 2.85m, which is greater than the chambers width of 2.78m, so we have no turning clearance. Whether this was an error on the part of the builders we will never know, but their only solution in the above scenario would be to cut depressions into the side walls to allow the sarcophagus to turn, and afterwards, patch up the depressions.

[63] Ibid, page 31-32



The above section is of the king's chamber in the Northern brick pyramid. The yellow box highlights part of the vertical construction shaft in which the sarcophagus was lowered; a passage was then made along with an opening in the wall of the burial chamber in order to introduce the sarcophagus, this solution does not appear apparent in the Black pyramid. Also in Senwosret's chamber above, we have a second massive limestone roof above the vaulted granite roof of the chamber: thanks to de Morgan's tunnels at this pyramid, we know that this was constructed in a larger construction shaft. This massive limestone roof protected the granite chamber below; it's not known if anything similar was built at the Black pyramid, though I suspect not, judging by the cracks visible in the chamber, which are very similar to the stresses shown in the other chambers. If such a

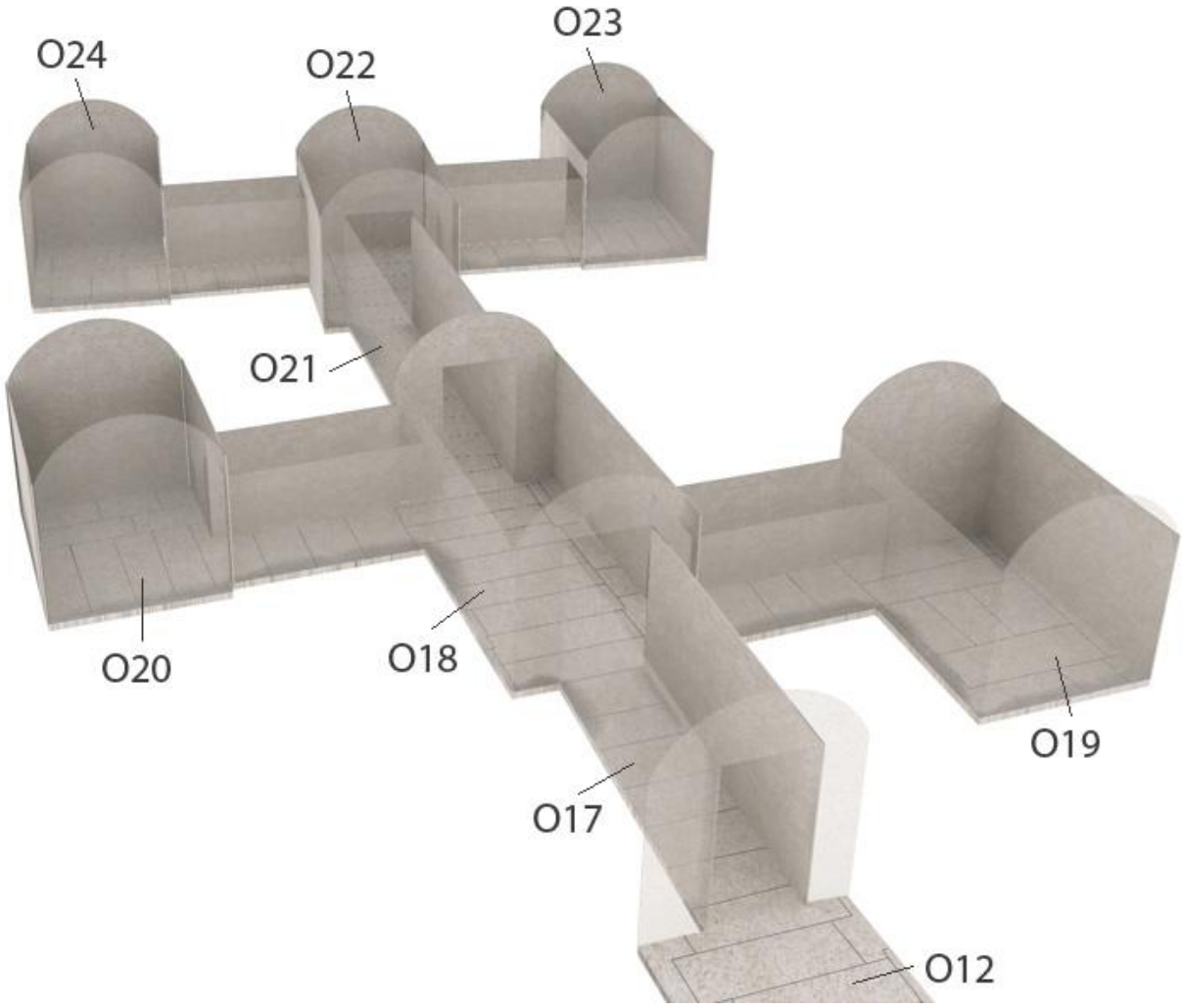
massive limestone roof was built at the Black pyramid, it would have settled, protecting the chamber below; much like the paving slabs in the chamber are protected and unaffected as the walls with their foundation slabs settled around them. The impression I get, is that all the chambers were built in a similar way; a void would be dug out of the poor rock, and then all the ceiling beams, and masonry brought in by the unlined passage system; though further exploration would be required on the structure to determine construction sequence and possible location of any construction shafts.

O17 to O24

Retracing our steps from the kings chamber we return to O12 and head north via a short passage O17; some 3.96m long, 1.09m wide and 2.09m high.

Image courtesy of Colin Reader

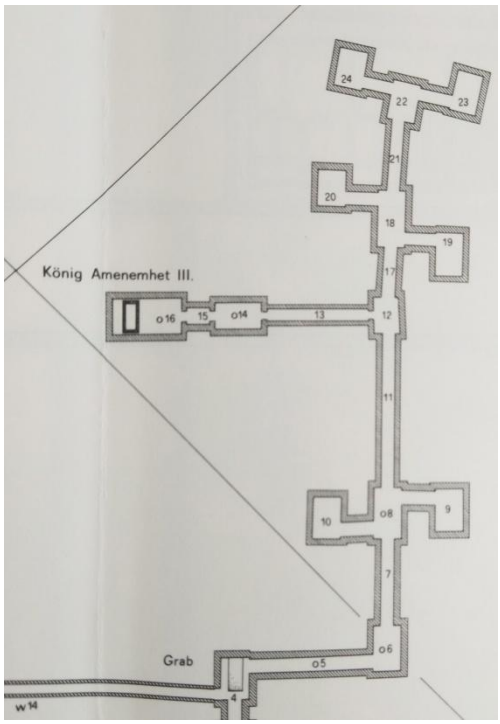
The image on the previous page shows the short passage O17 from inside O12; we can also see that the passage is not located centrally to O12 but shifted to the east: further, according to Arnold's Faltplan 1, it appears to deviate slightly to the north-east, as does passage O21.



The above image is a schematic view of the remaining chambers north of O12. O17 enters into O18, which has two passages branch off it to side chambers O19 & O20; the whole arrangement is like a mirror image of O8, O9 & O10 (though there is a significant difference in that the north wall of O20, and the south wall of O19 extend beyond the north and south walls of O18, whereas O9 & O10 are contained within the north and south boundaries of O8). Though these two groupings of chambers share very similar widths and heights, they differ in length; for example O18 at 4.56m long is the 2nd longest chamber in the pyramid after the Kings

chamber (O8 is only 3.89m long). As per the previous chambers all these chambers were roofed with vaulted ceiling beams and show evidence of having been filled with brick. According to Arnold's Faltplan 1, passage O17 appears to enter O18 centrally, and although O17 exhibits a slight direction change to the northeast, Chamber O18 itself appears to maintain a north orientation: this means that passage O21 which maintains the same skew to the northeast is displaced to the east of the chamber O18's central axis; much like we see in the image on page 47. This is a somewhat strange feature, which gets stranger still when we see how O21 enters chamber O22, which has two branches, which go to chambers O23 & O24. This last grouping of three chambers, are not staggered like the previous groupings, but symmetrical, sort of like the horns of a bull; moreover this grouping is more notably canted to the northeast than passages O17 & O21.

This noticeable canting of the last grouping is such that passage O21 has two lengths, west wall 5.74m and east wall 5.58m. The whole construction seems inexplicable; Arnold would state, *"It remains puzzling that the northern section of the royal corridor system, i.e. from corridor O17, angled so far to the northeast that it should not be a measurement error, but a specific intention. Did they have to avoid old grave shafts or any other fault in the rock?"*[64]



In plan view (a partial scan of Arnold's plate 37) we can see the changes in orientation. Those of you, who like seeing shapes in clouds, might see where I am going with this; but could the designer be incorporating a bull motif into his architecture? The head and horns of the bull canted like in the Narmer palette, with its left leg striding forward; whilst the heart of the beast is connected to the Kings chamber. Crazy idea perhaps, but I put it forward for want of a better explanation.

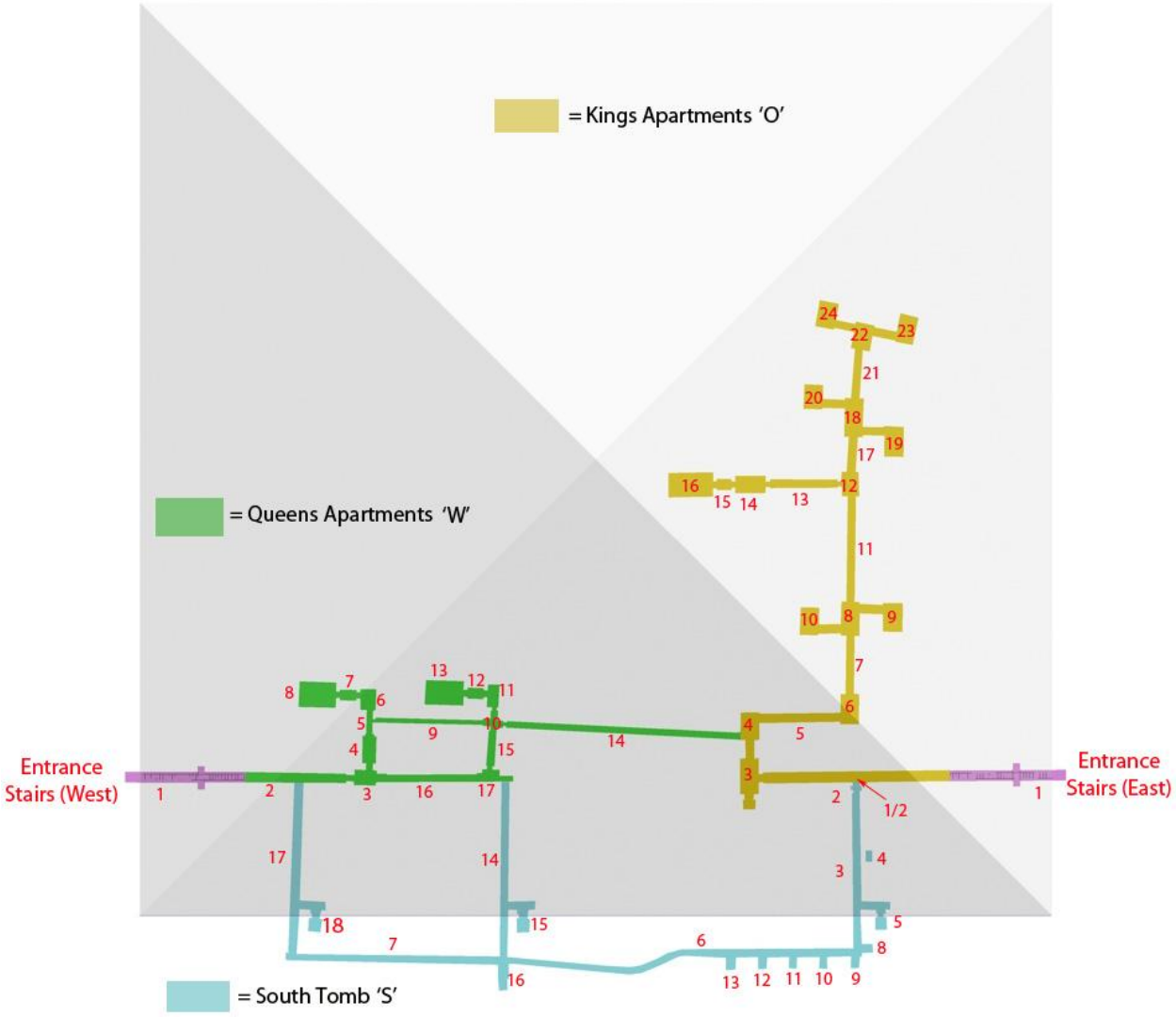
[64] Ibid, pages 76-77

Image courtesy of Colin Reader

The above image shows one of the side chambers, and judging by the floor slabs, we appear to be looking at the north wall of O20.

The Queens Apartments

The queen's apartments are accessed by their own entrance on the pyramids west side; and it seems that originally this may have been the only access point to the queen's apartments; however, at some time a later modification was made in the form of passages W14 & W9, which connects the queen's apartments to the kings apartments, via chamber O4.



This modification to the substructure seems strange as it clearly undermines tomb security, in that robbers had only to discover one entrance to have access to the entire substructure. It is also questionable whether the South tomb elements of the kings and queens were originally connected together.

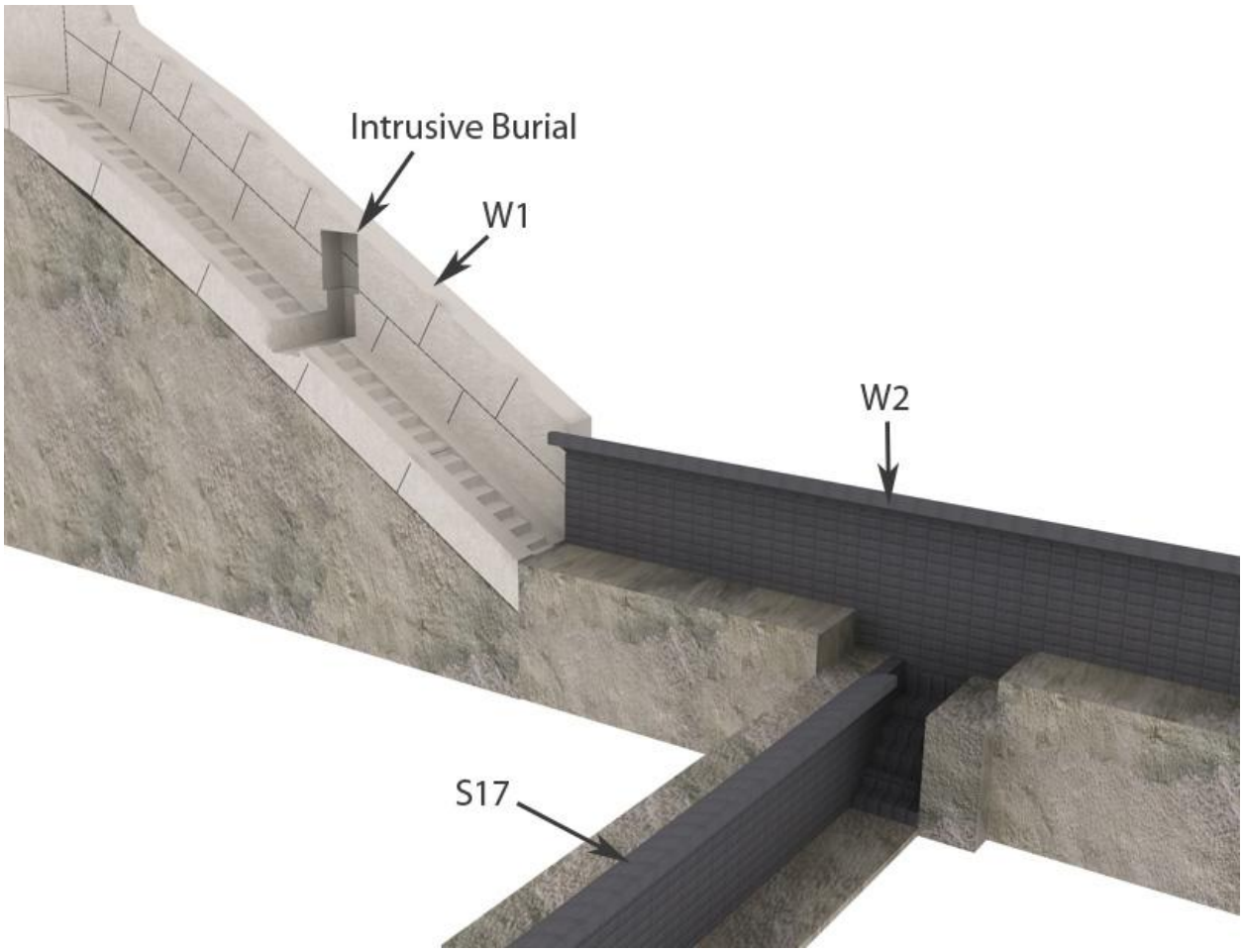
The Western Stairway

The western stairway is very similar to the eastern stairway, and likely constructed in the same manner; it too had an intrusive burial placed on its stairs. This stairway is in a better state of preservation, with most of its steps complete, along with a sizeable amount of blocking intact inside the passage. The better preserved blocking is below the intrusive burial, where we have two courses of large blocking stones, one of which was cut into to create a space for a canopic chest. Robbers at some time had cut through the upper course to enter the tomb. It's always difficult to determine when this blocking was originally fitted; though the blocks are described as being tightly fitted and well plastered together, and that the robbers had little choice but to cut through them. This may be original blocking after the burial of the last queen; assuming that the queens died at different times, would one block a passage so thoroughly after the burial of the first queen?

The blocking above the intrusive burial of Sithathor is far from uniform, being a mixture of some large stones and many small blocks and bricks. It's possible that the intrusive burial had in its turn also been robbed and repaired; as for the breach in the blocking below the intrusive burial, it's hard to come to a conclusion when this was done, i.e. was it done before the intrusive burial? Arnold would develop a possible sequence of events for this stairway[65] but the permutations are many and it's hard to come to any definitive conclusion.

The quality of construction in the western stairway matches that of the eastern stairway, and although better preserved, Arnold would state; *"Although there are even foundation blocks in situ in the upper area, so much material has been removed in the area of the actual entrance that the position and shape of the entrance can no longer be reliably reconstructed."*[66] The huge amount of debris prevented observation of the western limit for the foundation trench, but it appears that both stairways closely mirror each other in size; for example the vertical distance from the top of the stairs to their bottom is approximately 6.86m for O1 and 6.80m for W1. Likewise, burial chamber levels are quite similar; Kings chamber O16 is given as 3.71m below NN; queen Aat's, W8 – 3.62m below NN and unidentified queen W13 – 3.52m below NN (NN refers to a measuring point of the Survey of Egypt set into the ground northeast of the valley temple in the form of a railroad track.[67]

[65] Ibid, page 39
[66] Ibid, page 39
[67] Ibid, page 105



The above image gives us a rough idea of the arrangement of the western stairway; we have the intrusive burial cut into the stairway, and at the bottom it meets passage W2. This passage was not stone lined but lined with brick with a shallow vaulted ceiling, which was originally plastered white. The passage is badly deteriorated, with its width varying between 0.95 to 1.13m wide; Arnold would suggest that 2 cubits was possibly its intended width: the height to the apex of the vaulted ceiling is between 1.50 to 1.60m. Arnold would also state that the lining was carried out very carefully from the inside towards the western entrance.[68]

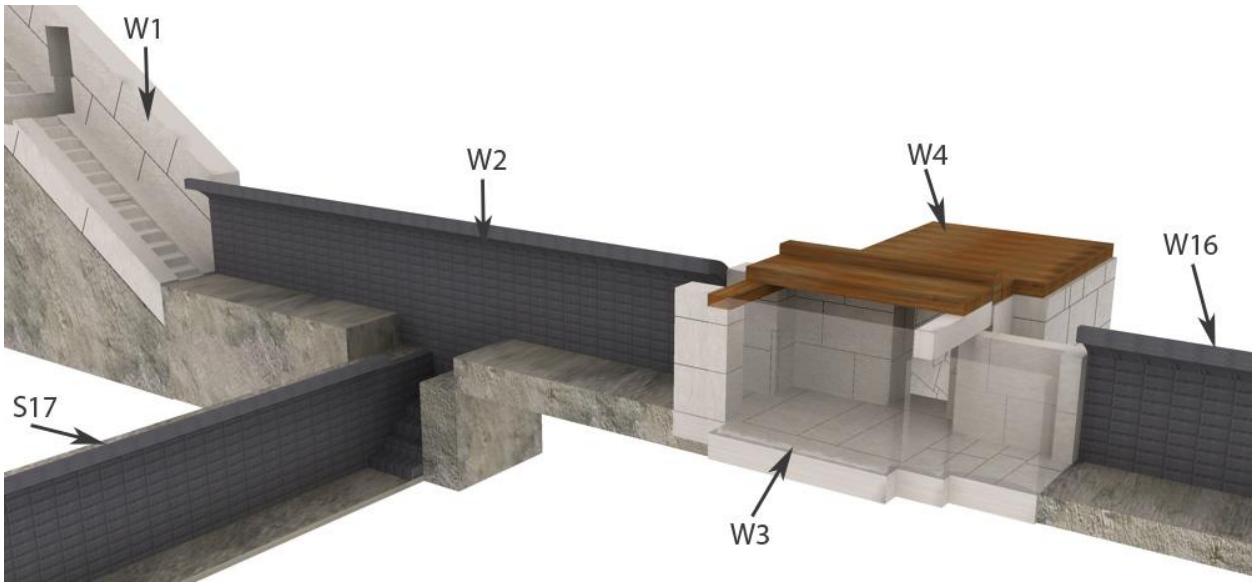
It was probably the builder's original intent to line this passage with fine stone, however, as we will see, the queen's apartments are in various degrees of incompletion, with lesser materials such as brick and wooden beams being employed. It seems major movement of the structure occurred during their construction, which brought about changes in plans. This is in contrast to the Kings apartments which where all successfully completed in stone; this possibly being

[68] Ibid, page 39

down to priority being given to the Kings apartments. The fine western stairway, being likely built in a trench would be constructed early in the pyramid build so as not to delay superstructure construction. It is possible that the Kings apartments were completed with no settlement problems being apparent to the builders as they continued to raise the superstructure; then as they turned their attentions to the construction of the queen's apartments, things started to go wrong, with the ground deforming under them. This also effected the kings apartments, where we see plaster repairs in wall cracks, floor leveling, under the ends of the sarcophagus etc; maybe the builders thought things would settle, and hoped for the best, but ultimately problems continued to the extent that the builders thought it necessary to support the three burial chambers, by filling them with stone.

The lining of Passage W2 would be one of the last constructions as the builders worked from the inside out; as it is only about 1m wide, it would impede transport of masonry down W1, which is some 1.26m wide. W2 is given as 12.18m long to chamber W3, and approximately midway along its length we have an opening in the floor that provides access to passage S17. Large steps were let into the floor east and west of the opening, and below these we have a set of five steps constructed from brick, which lead down to the floor of S17 which is about 2m lower than the floor of W2. Arnold reports that in an extension of the stairs to the north there was a 29cm deep alcove, arched and plastered white, which was later bricked up; he suggested that this space was to assist larger objects to turn and access S17.

According to Arnold's Faltplan 2 the rock floor is level with the bottom of the stone stairway; it has not been cut down to allow for a later stone pavement. This is probably a sensible arrangement as sledges came of the stairs on route to the inner chambers, with the rock floor only being cut down for stone paving at the end and sealing the entrance to S17. The east and west steps of the opening to S17, could also accommodate beams to create a temporary bridge over the opening to allow sledges to traverse along W2. However, the solution for the larger opening in passage O2 for the construction of S1/2 is more problematic; here, we have a span of some 8m to contend with, half of this being taken up by the chambers S1/2, and the rest by the ramp that leads to them; this is a major obstacle to the transport of masonry along O2 and poses some problems.



Chamber W3

Passage W2 enters into a stone lined chamber W3, whose length is between 2.45-2.49m, with width 1.75-1.78m, and height at the walls 1.68-1.71m. In its north wall a doorway leads into chamber W4, which has a stairway in its floor that leads to W5; whilst in its east wall another doorway opens into a small stone lined niche, whose slabs are only 22cm thick: the east wall of this niche had been chiseled through, and beyond that we have a brick lined passage W16.

W3 & W4 where roofed by wooden beams; 4 beams spanned W3, and were supported at their east end by a stone lintel above the entrance to the niche, whilst at its west end they were supported by a wooden beam, which was let into the doorposts. The floor of W3 consists of 4 large paving slabs, whilst the walls rested on their own foundations, which had sunk up to 7cm; according to Arnold the easternmost paving slab had two holes cut into it by robbers.[69] The floor of the niche according to Arnold's Faltplan 3 is made up of small slabs; I could find no information as to whether the thin wall slabs rested on these, or how this niche was roofed.[70]

W3 sets a very confusing picture, it was filled with brick like W2, though robbers had removed the upper layers to gain access; however, Arnold reports that the remaining brick fill was laid somewhat careless, compared to other rooms, that he

[69] Ibid, page 39

[70] Arnold unfortunately provides no detailed sectional drawings of W3, so it's hard to get a clear picture of the chambers construction.

could not be entirely sure if it was the work of clean up teams or robbers: moreover, the pavement damage to the easternmost slab, suggests that this must have been done by robbers before the chamber was filled by bricks.[71]

There is evidence that all three doorways where blocked up; mortar traces show that the doorway to W4 was sealed from W3, with the doorway to W3 sealed from W2. The niche was found sealed by Arnold; this consisted of two plastered slabs, and a third one is believed to have existed, but this was replaced by three layers of brick. The niche is thought to have contained a limestone canopic chest; pieces of this chest were found in W2, on the floor of W3 under other limestone slabs, and in W16, where some large pieces were found: interestingly, Arnold thought that the canopic chest was not smashed randomly by robbers, but broken into rectangular fragments by stonemasons, through targeted blows; he would suggest that the chest was not broken for its contents, but because it stood in the way and because of its weight it could not be removed from the pyramid.[72] He would speculate that W3 along with the canopic niche had been completed, when the decision had been made to add the unidentified queens chamber further to the east; this would necessitate the destruction of the canopic chest and removal of the rear wall of the niche.[73]

The locations of the chest fragments are interesting, the fragments found on the floor of W3 along with the holes made in the floor, as well as other artifacts, such as a cup used as a lamp and carnelian fragment of an eye insert, suggst that the niche had been violated before the current filling of brick; moreover, the niche was found sealed, with two slabs and a few brick courses, which on removal showed the niche to be filled with brick. In W2 the fragments are said to be found in the second lowest layer of the bricked up passage, and in W16 large fragments of the canopic chest were found some 2.80 to 5m away from the niche, and this showed that the work was being done from the west; amongst these fragments small remains of gold foil and faience were found.[74]

This tends to suggest that violation took place before the bricking up of the passages and chambers. The blocking of the niche doorway must have been done before the bricking up of W3, and if we assume it was closed with three slabs of stone, then who removed the top one? Possibly another set of later robbers, but then who restored the breach with bricks? The whole area is very confusing, and

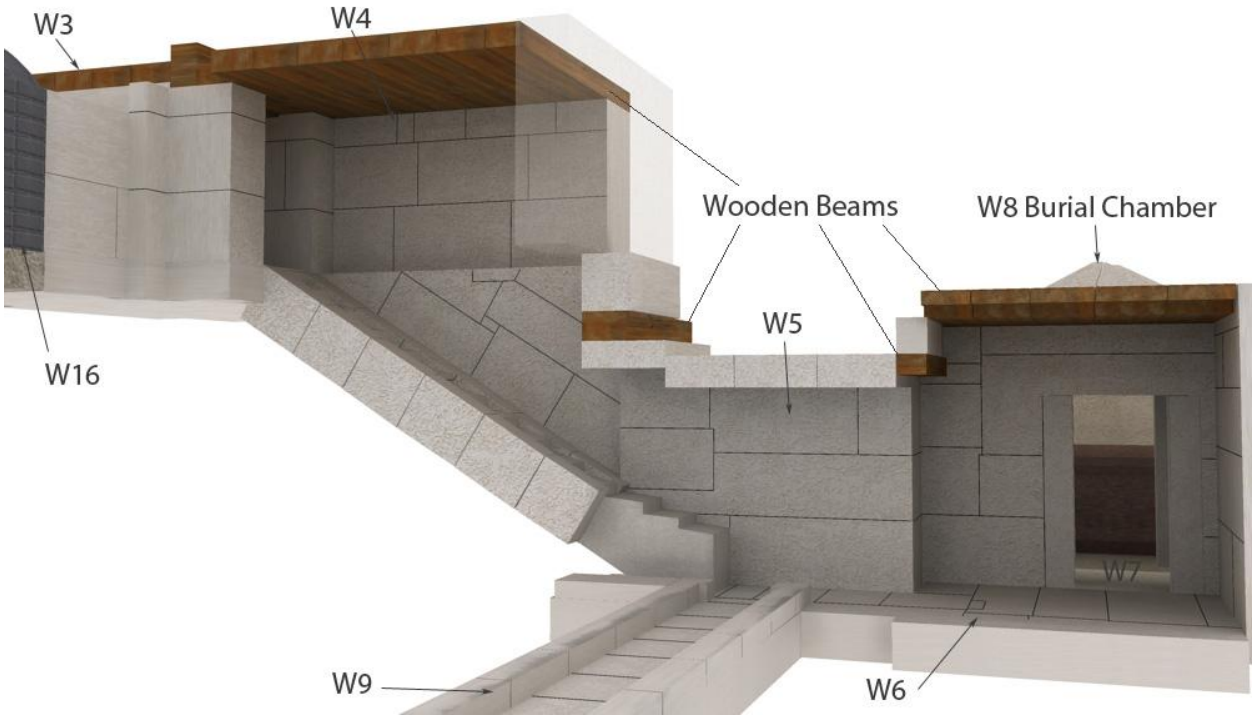
[71] Ibid, page 40
[72] Ibid, pages 40-41
[73] Ibid, page 93
[74] Ibid, page 45

it’s hard to get a clear picture of the scene that greeted Arnold from the information provided in his report; such a complex structure as this requires several volumes, though undoubtedly publication costs means that so much has to be condensed into one volume.

The limestone canopic chest appears not to be of great quality, Arnold would describe is as noticeably rough, as if it had not received its final dressing, which seems strange given the fine quality sarcophagus provided for the queen. The box itself measures 93cm square, with a height of 78cm; the lid, domed like the sarcophagi lids, was 16.5cm high, making the total height of the chest at around 94.5cm. The niche can accommodate such a box as its floor print (by scale rule) is about 1.1m E-W, and 1.0m N-S. It would seem strange that they took it amongst themselves to break this box up if it was in the way; its location so close to the western stairway would surely be an easy task for the builders to remove; though the box would have to be placed on its side, as the western doorway of W3 is only about 85cm wide.

The thin lining of the niche and small paving slabs give the impression that the niche may not have been an original feature of W3, but a later adaptation; what then are we to make of the passage W16, which came first, the niche or W16? W16 would lead to the unidentified queens apartments, which is of a very similar design to queen Aat’s, though Aat’s is more complete; but does this mean that the unidentified queens apartments are a later change of plan that would necessitate the destruction of Aat’s canopic chest and niche to create W16. I would suggest possibly not and that they may have been both originally planned; Aat’s chambers are closest to the western entrance and one can imagine that this was excavated first as W16 continued eastwards: being excavated first, Aat’s chambers would be lined first, whilst the second Queens chamber lagged behind. Both burial chambers were complete; it is only the elements as the builders work from the inside out that demonstrate different levels of completeness in the two sets of apartments, but this could be explained by Aat’s apartments having a construction head start.

Another reason why W16 could be first is to do with the introduction of the sarcophagi, how exactly where they introduced, did each burial chamber have its own construction shaft, or could they be introduced via the passage system, as I suggested in the Kings chamber? The sarcophagi are sizeable items, but as far as I can deduce from Arnold’s drawings, I feel that these items could be introduced via the passage/chamber system; albeit those constructions would all have to be unlined to allow the sarcophagi to pass.



W4 to W8

The above section looking west gives us a rough idea of what greets the visitor after they leave W3 via the north door. We enter into chamber W4, which by scale rule is about 1.5m wide and 2.9m long; in the middle of the chamber a stairway with ramped sides leads down to a short horizontal passage W5, which is less wide than the combined width of the steps and ramps (the steps vary in width from 34-38cm); around 90cm versus 75cm. The short passage W5 enters into chamber W6, and like chamber O12 the entrance does not align with the chambers axis but is offset to the east. In the west wall of W6 an entrance opens into a short passage W7, similar to O15, which leads into the Queens burial chamber, W8.

The floor level difference between W3 and W6 is about 3m. There is a similarity in design between W4 and O3; here also the side walls of the stairs are inclined with the stairs, with the top of these walls leaving a noticeable ledge along the long walls. Found on these ledges was a brick wall to help support the wooden ceiling beams.[75] Unlike O3, the steps extend beyond the north wall of W4 and appear to have been cut off at the bottom, leaving a large 54cm high step, which gives the impression of some modification. This modification appears to be related to the narrow passage W9, whose entrance in the east wall of W5 seems to align with the cut off portion of the stairs; we see a similar arrangement in the other Queens apartments. It appears that a decision was made to connect the two apartments at a

[75] Ibid, page 42

lower level and extend this connection to the Kings apartments via chamber O4. The location for W9 was extremely limited; it could not for example enter into the east wall of W6, as the other Queens burial chamber was in the way; so they had little choice but to enter into W5 and provide a safe distance between W9 & W13(the unidentified Queens burial chamber). When this apparent change of plan was decided is unknown; but Arnold notes that there appears to be no obvious changes to the masonry of W5's east wall.

Another strange feature is that the north wall of W4 is not aligned, with the south end of W5 (in O3 the lower passage is aligned and provides added support to the north wall of O3); instead, we have the base of the north wall, at floor level of W4 jutting out some 25cm and unsupported: the remainder of the wall appears to be supported by a stone beam and below this a wooden beam, which appears to rest on a ceiling slab that is placed at a higher level than the remaining ceiling slabs of W5. The whole construction is very strange, though the higher ceiling slab provides extra clearance, which is much needed, as passage height is only 95cm at this point, whereas passage W5 is around 1.75m high.

Strangely W5 is roofed with stone, whilst W3, W4 & W6 are roofed with wooden beams. Arnold would state; *"While the room W6, which followed further inside, apparently did not yet have a ceiling when the building disaster occurred and had to be covered with wooden beans, the corridor W5 was strangely covered with stone slabs against all logic of the construction process. How this irregularity can be explained remains unknown……How a stone vault-as it was certainly planned for W6-could have been brought in after W5 was already covered, remains a mystery."*[76] It is not known what ceilings were intended for these chambers, but given their smaller widths it is possible that they could have been roofed with flat beams; for example W7 has flat beams and is 1.27m wide; W4 is 1.5m wide, W3 is 1.75-1.78m wide, and W6 1.73m.

It does seem illogical that W5 be roofed before W6; five wooden beams span W6, with their ends cut out slightly so that they engaged on top of the wall, and helped the walls from being pushed inwards. At the south end of the chamber another wooden beam is found in front of the lintel for W5, and on top of this rested four small limestone blocks, which filled the gap to the last wooden ceiling beam. Arnold would suggest *"Perhaps the rock was already so far down that it was no longer possible to insert a 6th beam and so was forced to build up from below.*

[76] Ibid, page 42

Because even from the south, the freedom of movement was impaired by the fact that a stone ceiling was already lying over corridor W5."[77]

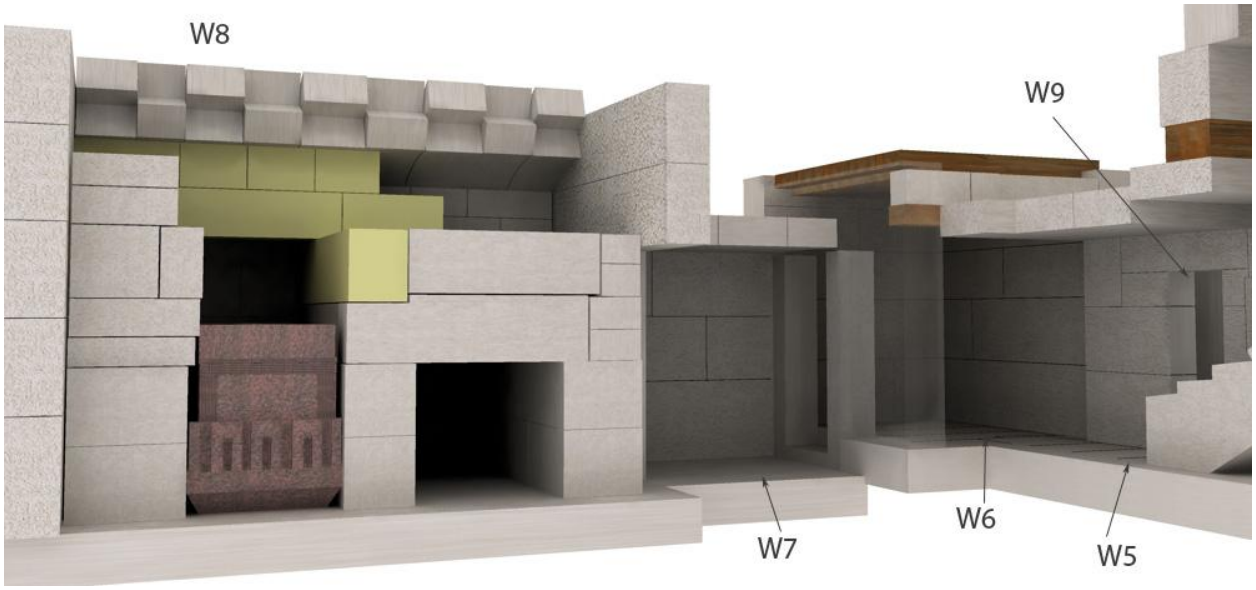
A possible solution might be that W6 was originally roofed with stone beams, and that some movement in the locale cracked said beams. This may have concerned the builders enough to remove the defective stone beams and replace them with more flexible wooden ones. Inserting such beams may require some maneuvering space; could the small beam carrying the four small limestone blocks, be designed to fill this space? Looking at Arnold's Faltplan 3, we can see considerable sinking of the wall foundations in relation to the paving slabs of W6, but more strange is that we appear to have two steps from W6 into W7, such that there is a difference in floor levels between W6 & W7 of 27cm, where these steps intentional or a solution to movement in the structure? The length of W6 is 2.45m and its height about 2.26- 2.32m; when Arnold found the chamber its floor was covered in sand and up to 8 layers of brick lining were preserved, on top of which was rubble from the grave robbers; amongst this rubble was part of an alabaster ointment jar, whose inscription showed that it belonged to Queen Aat.

The short passage W7 which leads to the burial chamber W8 is practically identical in size to that by the Kings chamber O15. Access to the Queens chamber is still largely restricted by a sizeable mass of stone filling, which prevents us from closely examining the makeup of the chambers masonry; the robbers appear to have extracted enough to allow them to go about their work. The fine granite sarcophagus, like the kings, is set a distance from the west wall, which allows the lid to be stored behind and pulled forward on closure: all three sarcophagi have a ramped projection on the undersides of their lids, so that on closure, the edge of this projection would abut against the inside edge of the box, and prevent it from being pulled off. The sarcophagus at its widest projections is 2.61m long, 1.05m wide? (The stone blocking makes it hard to examine all areas of the sarcophagus) and 1.30m high. This makes it the same length as the Kings sarcophagus and as the three burial chambers share the same width (which helps in roofing beam production) we run into the same problem as to how the sarcophagus was introduced. The stone filling prevents us from observing the walls to see if trapezoidal plates exist, or the square holes that might have assisted fitment of the lid. If construction shafts existed that allowed the sarcophagi to be pushed in without turning, then they are more likely to exist outside of the chambers west walls. It might be worth doing some GPR through these walls and see if they exist.

[77] Ibid, page 42

Image courtesy of Colin Reader

The image on the previous page is taken from inside W7, looking into Queen Aat's burial chamber; the sarcophagus lid is propped open, and the masonry fill to reinforce the chamber is still quite extensive. At the top of the west wall, we can see that they even shaped the fill blocks to match the contour of the ceiling. In front of the sarcophagus a transverse space has been left by the builders of the masonry fill, which was spanned by long beams on edge around 1.8m long; these beams rested on masonry blocks that fronted along the sarcophagus and the east wall (some of this masonry has been removed in front of the sarcophagus by Arnold, who sawed through two blocks, in order to view the niche decoration). This transverse space is given as 2.80m wide and 1,10m deep, so it takes up the width of the chamber.



The above section looking northeast gives an idea of sarcophagus position and the transverse space in front of it; this space was probably left for safe storage of funerary equipment. The yellow blocks is a rough guess, would the builders place masonry directly on top of the sarcophagus or bridge the space as shown above? The question arises as to when this masonry fill was fitted; after her burial or was it partially fitted before her burial? It is possible that a space could be left down the centre of the chamber, a bit like the image on the previous page; Arnold would suggest,

"This cavity (transverse space) *was bridged above the second block layer by a series of 10 upright limestone beams approximately 1.80m long, 30cm thick and 53cm high. Before the burial, this was done only on both sides with 3 beams each, while the remaining four in the middle are only put on after the sarcophagus has been closed. For this purpose they will have been prepared in vestibule W6. Before*

the burial, smaller blocks were piled on the three beams along the longitudinal walls of chamber W8, which filled the room up to the vault. The back of the uppermost filler stones was curved to fit the curve of the vault. After the burial, the space between the sarcophagus and the west wall of the chamber was blocked up, then the space above the sarcophagus and finally the space between the side structures up to the exit to W7. These blocks were also probably already finished and ready. Almost all of the stones had offset inscriptions from which their exact location in the burial chamber could be read. One might assume that a sample grave chamber made of bricks was built above ground for its custom made manufacture, in which the blocks were fitted as a test."[78]

The above scenario is possible, but it might also be possible that this entire stone fill may have been done after burial. In W7 cracks were found that had been repaired with plaster; so like in the Kings Chamber one might assume that when this repair had been done that no decision had been made to fill the chambers and passages. The unidentified Queens chamber is also similarly blocked up with stone, and whilst its corresponding chambers to W8 & W7 appear completed, we find that its corresponding chamber to W6 only had its two entrance walls constructed of stone with the north and east walls constructed from brick; moreover, the remaining corresponding chambers, were mostly unfinished, and constructed of brick and wooden beams. There is a sense of abandonment in the unidentified Queens apartments; if movement in the structure was so bad, why not abandon these chambers, just as the king abandoned his, to build a new pyramid at Hawara. Could both Queens have died early and be placed in their respective chambers before major problems arose with the structure, and what would be the options for the king, and his buried Queens? He could either remove the bodies or best preserve their final resting places by filling their burial chambers with stone.

The sarcophagus in W8 is another fine piece of work, though nothing much was found inside other than a few rotten planks of the wooden coffin. The stone fill prevented Arnold from measuring the niche decoration on three sides of the sarcophagus; though the front shows five gates like the Kings, with a prominent southern gate. Arnold gives the width of the sarcophagus as 1.05m with a question mark, possibly because of access problems due to the stone fill, with a length of 2.61m; this gives the diagonal of the box at its widest as 2.81m, which is very close to the width of the chamber, which Arnold gives as 2.80m: no tolerances are given: but tolerances might allow such a box to turn inside the chamber. No such problems exist in the unidentified Queens chamber as her sarcophagus is but 2.45m

[78] Ibid, pages 42-44

long and 99.5 cm wide, again with a question mark. The sarcophagus in W8 has quite an impressive double bevel profile on its bottom, and like all sarcophagi in the pyramid it has a set of wadjet eyes facing east at the north end of the box.

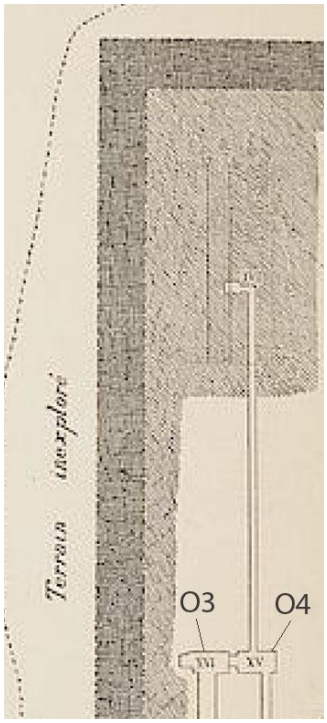
The Unidentified Queens Apartments

The above section gives a rough idea of the layout of the unidentified Queens apartments; the similarity to Aat's is clear, though dimensions vary. There are three routes of entry, two from the west; the upper passage W16 and the lower passage W9, whilst the long passage W14 enters from the east. The lower passages W9 & W14 converge on the short passage W10, and like in W5 this lower passage appears to cut through the unfinished stairway of W15. At the bottom of the unfinished stairs, two limestone blocks were found abutting against its vertical face, as if an attempt had been made to wall up the unfinished stairway: the stairway itself was found completely bricked up to the ceiling, and an attempt had been made to remove some of this filling from the bottom; either by De Morgan's men or robbers.[79] W10 had been badly affected with the stresses imposed on it and De Morgan had the passage shored up with timber, which prevented Arnold from closely observing its construction.

De Morgan's work in this area is a mystery in itself; in his work, he merely states, *"From room XV* (O4) *starts another corridor 41.75m long, which through the*

[79] Ibid, page 49

small room XVII (?) *communicates with another entrance."*[80] Now passage W14 is given as 27.15m long from O4 to W10, and W9 is given as 12.08m, giving a total length of 39.23m, and to this must be added the width of W10, which brings it close to De Morgan's figure of 41.75m (Arnold would give an overall length including door frame of 41.80m). This suggests that De Morgan had reached W5 at least.



De Morgan's plate XVII shows the long 41.75m passage heading west from O4; it appears to terminate at W5, we see a turn to the south and the small chamber XVII. The southward turn might be the stairway W4, and chamber XVII could be W3; if he got this far, he might have seen enough of passage W2 to assume that it led to another entrance. W2 might be the strange outlined area, which heads east and west of the small chamber; did he see the blocked up niche in W3 and assume the passage continued further east and connect with the stairway W15?

Whatever the interpretation, it is strange that De Morgan should miss the Queens burial chambers; Arnold found it easy enough to crawl up to the burial chamber on his belly.[81] Maybe it was getting near the end of the season; moreover, De Morgan was severely overstretched with other excavations in the Dahshur area.

The introduction of this lower passage system connects the Queens apartments with the Kings, and as a result, the short passage W10 becomes a major crossroads; though like the niche in W3 it is lined with thin limestone slabs about 20cm thick.
This crossroads had provision for three doors, though none were fitted. Each door frame appear to have cuttings for upper pivot fittings, similar to those found in the northern brick pyramid; and all doors are single leaf: neat holes were cut into the doorframes for a bolt. Strangely, given the position of the pivots and door bolts, when all three doors were shut and bolted, the only way out was up the unfinished staircase W15, which seems strange, as the lower passage basically cuts the bottom of the stairs and hardly makes them practical, and yet they must have been satisfied with this extraordinary large drop at the bottom of the stairs.

[80] Fouilles A Dahchour, 1903, page 105
[81] Der Pyramidenbezirk des Königs Amenemhet III. In Dahschur. D Arnold, Vol 1, 1987, page 49

The three door positions are shown above, all doors open and are locked from inside W10 (two other door locations exist inside the pyramid, one at the west end of W9, which is locked from inside W9, and the other at the east end of W14, which is locked from inside O4. Of these 5 doors, only the most western door by W9/W5 had a pivot hole in the floor)

Chamber W11

W10 leads into W11, through a doorframe close to 70cm wide (by scale rule). W11 differs from its comparable chamber W6 in being quite narrow; only 1.28m wide versus 1.73m for W6. Further, its north and east walls were built of brick, not stone; moreover the stresses pressing down on this chamber, not only cracked portions of the stone walls, but have pressed down on these brick walls, such that the wooden ceiling beams slope down to the east. The narrow nature of W11 is a concern, for the burial chamber was blocked up with stone in a similar manner to Queen Aat's, and it too had long stone beams of about 1.80m long; moreover, the internal space in the sarcophagus allows for a wooden coffin, up to some 2.03m long, 58cm wide and 68cm high[82]: so we have a somewhat awkward turning room in W11 as its is currently configured. This suggests therefore that the burial of the queen along with the blocking of the chamber might have occurred before the brick walls were constructed. How thick these brick walls are is unknown, along with what space might be available behind them; but it seems to me that with these

[82] Ibid, page 52

brick walls removed there would be more practical space for the workman to turn such lengthy items; then with the burial chamber completed, and given the structural problems evident to them, there would be no need to finish W11 to its original dimensions, as it no longer needed to be a turning chamber, better to finish it narrower to better withstand the stresses. W11 is slightly shorter than W6, though taller; when it comes to the floor no paving was fitted, foundation stones were fitted under the stone wall elements, but the rest of the floor is left in the natural rock, slightly proud of the finished paving of W12.

Arnold found W11with up to 5 layers of its brick filling remaining, the filling itself did not lay directly on the floor but on a thick layer of sand; in the northern half of the room a large number of clay pots was placed and covered in sand to protect them, and then the filling placed on top, but without success, as the ceramics were crushed. Arnold would state, "*A certain period of time must have passed between the installation of the ceramic and the walling, during which the white plaster of the cedar beams could trickle down onto the ceramic. Unfortunately, how long this process took cannot be estimated."*[83]

W12

W12 is very similar in construction and dimensions to its comparable counterparts W7 & O15. Inside this space were found broken pieces of furniture partly mixed in the sand and brick fill.

W13 Burial Chamber

The burial chamber like queen Aat's is difficult to observe due to the extensive masonry fill that is still present today (the Kings burial chamber may have been similarly filled, but this was cleared by De Morgan). Like in W8 we also have a transverse space in front of the sarcophagus spanned by long limestone beams; unfortunately, here the beams were laid flat not edgewise, with the result that they have cracked: in one place a large stone block was placed underneath to support the damaged beam.

Dimensions for the Queens and Kings burial chambers are very similar, the most noticeable difference being in length, with the Kings chamber being longer at 5.25m against the Queens at 4.1m. The lintel in W13 projected into the room by 1cm, not unlike what we see in chamber O12; this feature is also observed in W8.

[83] Ibid, page 50

The sarcophagus is another nice piece made of granite; it is the smallest of the three and less decorated. Its edges like the other two has reed matting décor, however, its plinth is left plain, with no niche decoration. Inside the sarcophagus two planks of the wooden coffin were found, up to 1.92m long.[84]

Like in Queen Aat's chamber we need to ask when this stone fill was introduced. The sarcophagus position in both Queens's chambers is a concern, as they effectively take up half the available chamber space, which could not be shored up with stone fill until after the burial. In W13 the front of the sarcophagus is some 1.9m from the west wall of a chamber that is about 4.1m long[85]; so if we accept the position that only the front half of the chamber was shored up with stone, with an access space left down the middle of the fill to enable the burial of the queen at a later date, we arrive at a strange situation with the builders having serious concerns about structural integrity, that they had to support the front half of the chamber, but no means to support the rear half of the chamber, due to the sarcophagus and lid storage. This appears illogical, in the above scenario the queen could be years from her death, with possibly the superstructure rising further, adding to the stresses on the chamber, especially above the unprotected sarcophagus; moreover, why was W11 not completed along with the stairway during the period before her death?

We do know that the space above the sarcophagus was filled with stone as Arnold reports mortar traces on the ceiling; however, the stone removed by robbers appears to not be enough to fill the chamber with stone; but instead a lot of brick appears to have been brought in to fill the middle of the room in the front half of the chamber.[86] The whole situation is difficult to interpret; the queen may have died early, just as structural issues were becoming apparent, with everything coinciding; the stairway and other parts abandoned or hastily finished in brick and wood. Another issue is when was the chamber built? If a change of plan that required the niche in W3 to be breached to add another chamber, would this change occur after the superstructure had been started and what does this mean for any possible construction shaft? Given the unfinished nature of the unidentified Queens apartments, should we not see a more complete construction if a construction shaft existed before construction of the superstructure? Surely many years would have passed before a sufficient mass of superstructure was built on top to cause the structural problems.

Construction shafts are handy for introducing large heavy items to the construction site, then afterwards filled up and finally covered by the superstructure build. Such shafts could not only introduce the sarcophagus, but the

[84] Ibid, page 51
[85] By scale rule from plate 51
[86] Ibid, page 51

chamber masonry, such as the vaulted beams etc. But if such shafts exist at the Black pyramid, should we not see better completed Queens Chambers? The sarcophagus was likely brought in last as it would only be awkward to construct a chamber around it; so we could have a situation that if a construction shaft existed that the burial chamber would be finished, the sarcophagus inserted and the construction shaft filled, to allow the superstructure build; but if this was the scenario, surely the apartments should have been finished long before the mass of the superstructure started causing problems.

I get the sense that construction shafts might possibly be absent at the Black pyramid, and that sarcophagi and chamber masonry including the vaulted beams were introduced through the unlined substructure and building from the inside out. Certainly it is within their capabilities, as demonstrated in Menkaure's pyramid where great beams of granite were brought in along the substructure to create its fine vaulted ceiling (possibly also at the Lahun pyramid). In the Black pyramid we have 17 vaulted chambers, and I feel it is unlikely each had their own construction shaft; likewise the sarcophagi could be brought in via an unlined substructure. Such a scenario might explain the scene we find in the Queen's chambers; possibly lagging behind the King's apartments in construction sequence as priority was given to the kings chambers; with the Queen's being constructed slightly later as the superstructure rose, and causing more problems as they tried to contend with the deforming ground around them. The nature of the ground appears to be little different to that of the Kings; indeed, the foundations in the Queen's burial chambers appear better, as a sinking of the foundations could hardly be observed.[87] It might be the case that as they built backwards from W13, that ground movement was such a concern, that other elements such as W11, W15 & W17, were shored up as best they could with brick and wooden beams.

W15 Stairway & W17

Little in the way of masonry is to be found in W15, other than a block with a few steps at the top of the stairs, on top of this rested some masonry whose upper blocks, had a step cut out, as if to receive some beams; certainly not the wooden beams as these sit higher on the top edges of the blocks. A few blocks of limestone were found on the tafl slope of the stairs, possibly to provide steps for the workers; they were found under the brick fill.

[87] Ibid, pages 43 & 51

W15 was basically framed in wooden beams with the walls between filled with brick that was found whitewashed. In the image above we can see that the west wall was bricked up to a certain level, then limestone pads were placed on it, followed by a wooden beam; two of these each end of the chamber, supported a wooden crossbeam, which in turn supported the wooden ceiling beams: the space in between was further filled with brick, to help support the crossbeam. The north wall is strange in that the lower three courses protrude out at the bottom and rest on more wooden beams.

W17 is similar to W15 in being a wooden framed chamber, with walls made of brick, and a ceiling made of wooden beams; again the bricks were whitewashed. W17 has a brick lined niche and Arnold thought that originally it would have a stone canopic chest like that in W3; "*but this was no longer an option because of the unplanned canopic niche and had to be replaced by a smaller wooden canopic box.*"[88] : Remains of this box were found inside the niche and W17. The niche had a shallow brick vault, was about 1.6m long 0.9m wide, and 1,6m high to the ceiling[89] In the floor of the niche a staircase leads down to passage S14, whose floor is approximately 2m lower; these steps were also whitewashed, the entrance roof of S14 was arched with three layers of brick, presumably to help support the brick wall of the niche above. The opening in the floor of the niche takes up most of the available floor space, leaving a small floor space about 40cm deep at the east

[88] Ibid, page 47
[89] By scale rule from plate 52

end. When found, W17 was largely filled to the ceiling with bricks, rubble and limestone blocks, only the lower half contained original brick fill, the upper half believed to be disturbed by robbers; the lower passage S14 was not visible or accessible, as if the robbers had exhausted this lower level, and used it as a dumping ground for limestone blocks from another search area.[90]

The passage W16 which connected W17 to W3 was in quite a damaged condition, which prevented reliable dimensions from being taken, though it was brick lined with a shallow vault, and again whitewashed.[91]

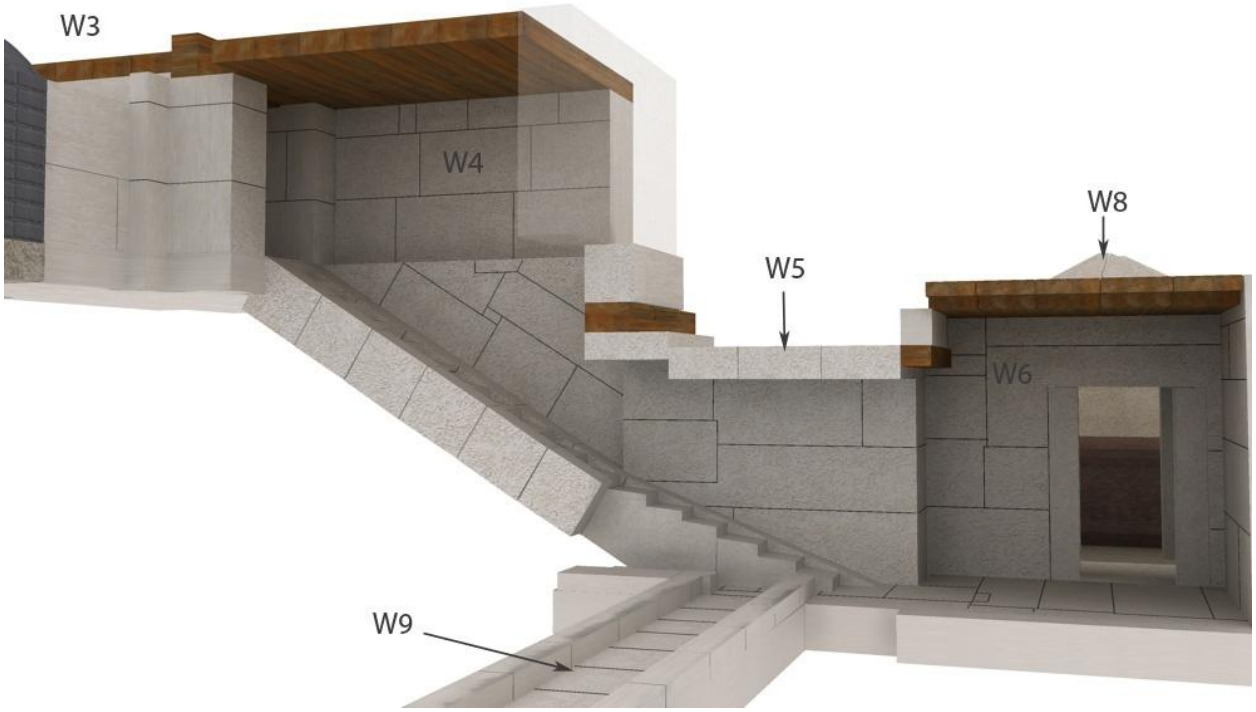
Passages W9 & W14

These two passages are the narrowest; W9 is but 66cm wide and W14 only 60cm wide; heights are similar, W9 at 1.65m and W14 at 1.71m; so really only comfortable for a single person to travel along. These two passages are constructed of stone, with three wall courses resting on the floor slabs, and roofed with 20cm thick flat ceiling beams. The walls slightly thicker at 25-30cm were only roughly smoothed with a 1.5cm wide chisel.[92] The two passages according to Arnold were not included in the original plan, but were only added later. As previously mentioned they appear illogical and compromise tomb security; one only had to find one pyramid entrance to have free access to all the chambers. When this change of plan took place is hard to determine, but some clues might help; at the end of W9 as it enters W5, Arnold notes that the wall masonry of W5 did not reveal any signs of subsequent changes[93], such as processing existing stone lining to admit passage W9; so it appears that W9 had been decided upon before W5 was lined with stone. This is in contrast to where W14 enters chamber O4, here Arnold states; *"The opening of the corridor into the west wall of chamber O4 was done when it was already completed. For this purpose, three blocks were processed where necessary, and the uppermost stone beam intended as a lintel was prepared accordingly. For example, a wooden door was initially planned and a recess for the upper pivot bearing and the stop for the door leaf were cut into this lintel."*[94]

[90] Ibid, page 47
[91] Ibid, page 45
[92] Ibid, page 52
[93] Ibid, page 42
[94] Ibid, page 52. There is some confusion on the walls of W5 & O4; on page 93 of his book Arnold, says *"Both exit rooms, in the west W5 and in the east O4, were obviously not yet lined with stone at this point, so that the necessary door openings could still be factored in."* This appears to conflict with the statement above, which suggests that O4 was lined before the entrance was made.

The drawings seem clear that the opening into O4 was created through a finished wall, and was made right in the corner which seems to go against convention, as every other corner entrance in the structure takes care to leave a small amount of wall free from the corner before the entrance starts.

So it appears one end of this long narrow passage was cut through a finished wall, whilst the other end by W5 was built, or was it? Playing devil's advocate, it is possible that the wall in W5 was also remodeled to allow the entrance for W9. Queen Aat's apartments are quite complete, notwithstanding the wooden ceiling beams; but what was the situation regarding the stairway, was it completed down to the floor of W5 before the decision was made to create W9?



In the above image I have completed the stairs down to the floor of W5,[95] now if these stairs had been completed, then W9 must have been a decision made afterwards; moreover, if the stairs had been completed it is likely that its east wall would also be completed. In this scenario, when the decision was made to create W9 they would have little choice but to cut through the east wall to create the entrance, and remove the lower steps of the staircase. I feel that this is a possibility that needs a closer look; on Arnold's Faltplan 3, the thin wall slabs that make up the walls of W9 appear to go through the thicker east wall and create the door frame, but if the stairs had been abandoned and the entrance to W9 was original

[95] Ibid, page 48, fig 21

and created as the east wall was built up, then why not incorporate the door frame into the thicker east wall? Unfortunately there are no published drawings or photographs of this wall to help clarify things, but the masons are certainly capable of doing a neat job if the wall had to be remodeled.

So I think it's a possibility that the walls of W5 & O4 were completed before the decision was made to create the long corridor W9 & W14. If so, it would appear to be a late decision in the substructure sequence of construction; assuming the kings apartments were built from the inside out, then O4 would have been one of the last constructions, so as not to impede the transport of materials to the inner parts of the tomb. The purpose of the long corridor is still a mystery; its narrow nature is unlikely to have been for the transport of materials, which in any event can be introduced through the western entrance and via the stairways of the two Queens tombs. The junction of W9 & W14, i.e. W10, necessitated the truncation of its unfinished stairway, and the masonry of this junction is likewise constructed of the same thin slabs that built the long corridor: and yet, when this junction was built they clearly must have envisaged the completion of this truncated stairway, as the bolting of the three doors in W10, allow only one way out, and that is up the unfinished stairs. It might be the case that the long corridor is one of the last stone constructions in the substructure; the incompleteness of W11 & W15 either side of W10, suggest a short period of time between its completion and the structural problems. Arnold would state; *"Although the rock was particularly weakened by the arrangement of the rooms at this point, it was clad with 20cm thick limestone slabs. Fortunately, when the construction disaster occurred, the critical intersection was already covered with stone slabs. However, these broke without exception under the mounting pressure and sank alarmingly downwards, that De Morgan, who had already uncovered this point, had to fill this crossroads completely with wood."*[96]

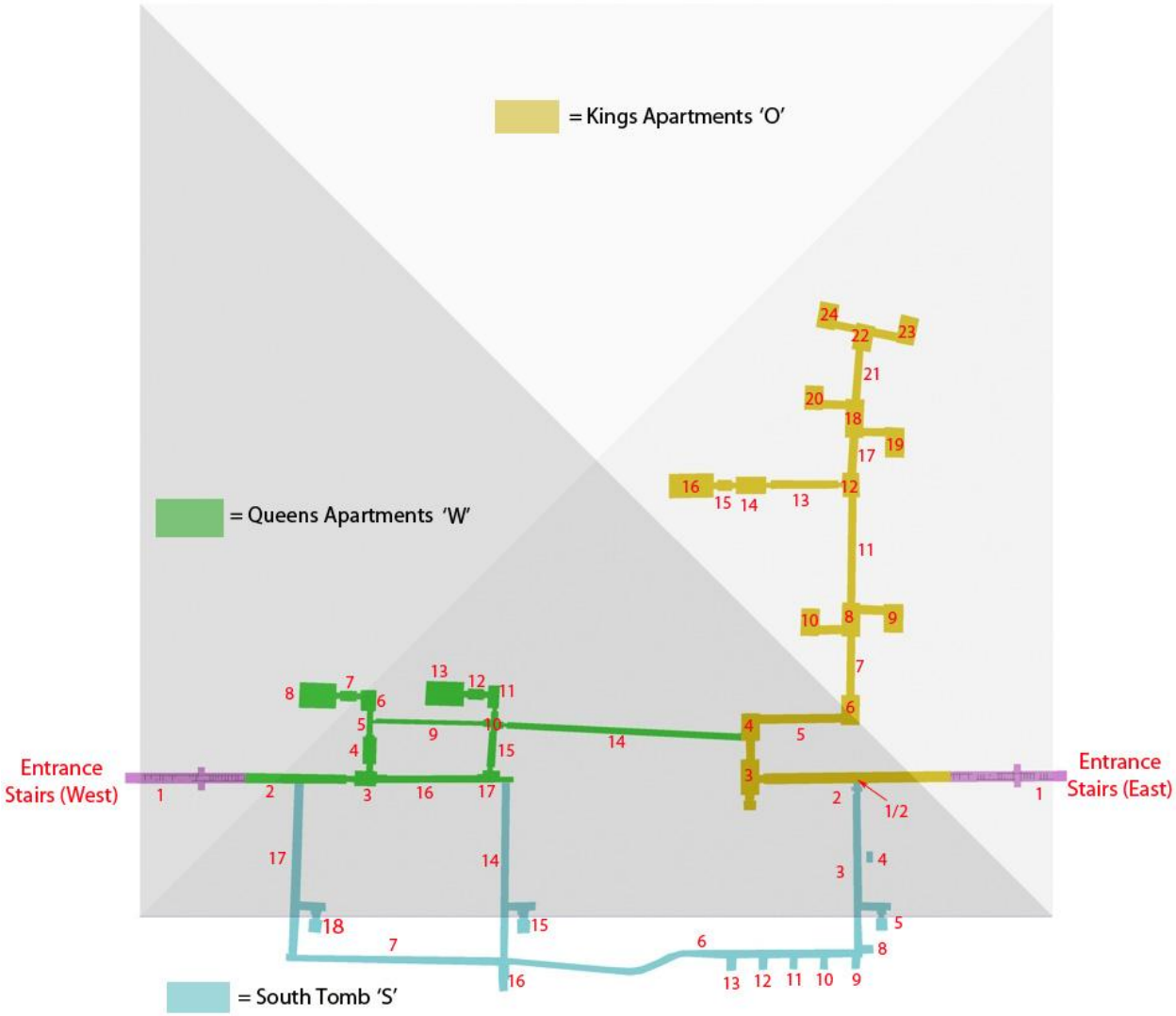
As previously mentioned no doors were fitted; at the door location in W5, a slab of limestone blocked the lower half of the door, and I assume the upper half was done likewise, but removed by robbers; strangely, some 5m along the W9 passage from W5 another slab of stone blocked the lower half of the passage. The doorway to W14 in O4 was likewise blocked up with stone slabs. The doorway between W10 & W11 was also closed with slabs of stone; how De Morgan found the remaining doorways is not recorded.

[96] Ibid, page 49

Image courtesy of Colin Reader

Long passage W14, length 27.15m, width 0.60m, height 1,71m

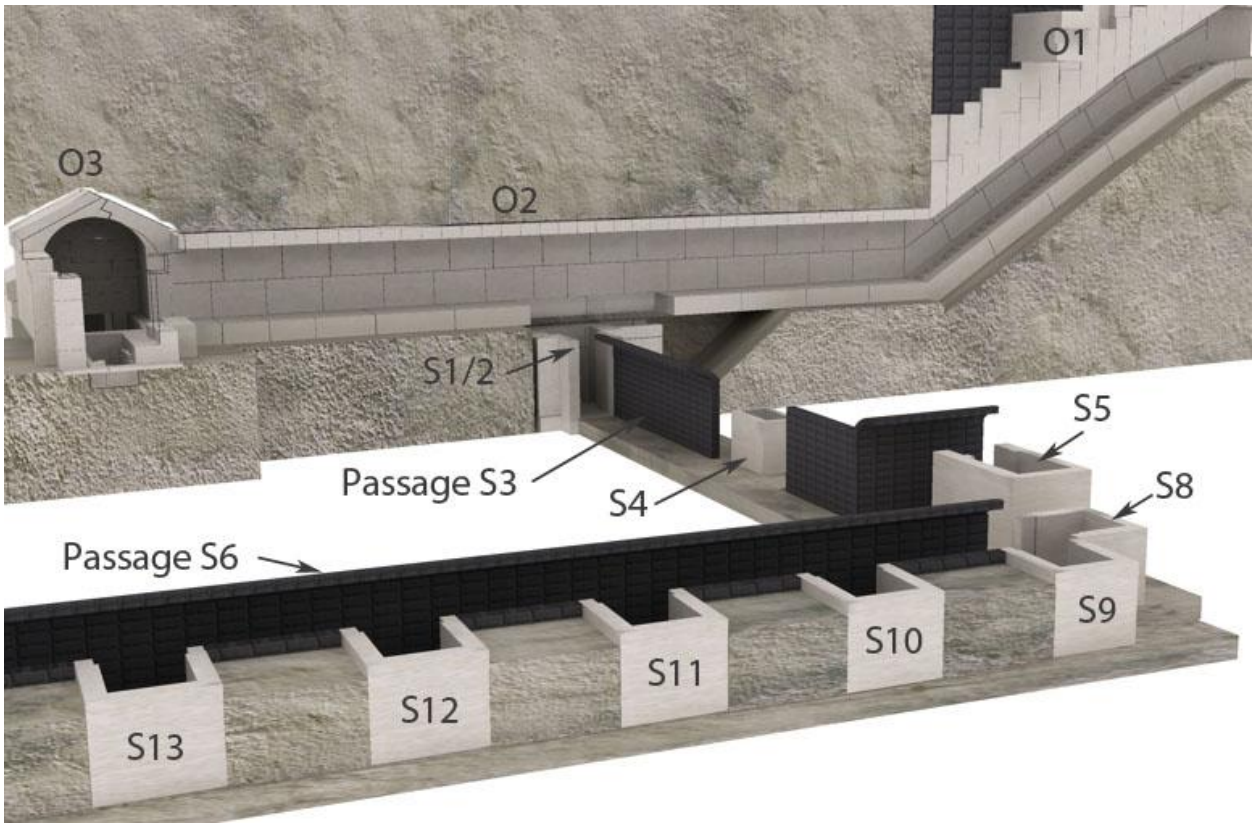
The South Tomb



The south tomb section of the substructure, coloured blue above, is just as baffling as the rest of the substructure. There are no sizeable chambers available here for human burials and it has been suggested that these small cells are more related to the Ka of the deceased. We do not know if originally it was planned that all these cells be connected together; from a security aspect they are a weakness as currently found; it would be more secure if passages S6 & S7 did not exist, and maybe they were a later addition like passages W14 & W9.

The principal cells in this section are S5, S15 & S18, and all three appear to be accurately aligned with the southern edge of the pyramid. The section from the Kings apartments has 6 further and smaller cells S8 to S13; as well as a very strange cell S4, which appears to have been some sort of secret chamber. One

further cell exists in the southern extension of S14, in the form of S16, which appears to have been demolished at some time. Brick is the primary material in the south tomb, with all passages being lined with it and exhibiting shallow vaulted ceilings; fine limestone is reserved for the cells, and we have the use of wooden beams which form a bridge to support the ceilings of the side passages that lead to the primary cells S5, S15 & S18.



Starting from S1/2 located under the floor of O2 we have passage S3 heading south; at the start the passage appears to be 1.80-1.86m high,[97] though Arnold gives 2.22m at some 13.60m, to enable access to chamber S5: the remaining 5.40m of the passage is reduced in height to 1.62m. The curved brick ceilings, consisted of three bricks with large gaps between them, which were stuffed with limestone chunks and mortar, the ceilings and walls, and possibly the floors were covered with clay mortar and whitewashed.[98] The passages in the south tomb range from 85 to 95cm wide.

[97] It's not clear from the report how long the 2.22m section in S3 is. Arnold's fig 26 shows the height around 1.84 at the location of S4. His text on page 57 states that the high section ends 35cm south of the entrance into S5; this spot would agree with his distance of 13.60m, but I can find no information as to the start of this high section.
[98] Ibid, page 54-55

The first unusual item in S3 is a small limestone cell behind the east wall, found some 6.40m from the start of S3; S4 appears to be a hidden secret chamber that had no door, it was constructed of limestone slabs, two for the floor, the walls consisted of two courses, each of 6 slabs, only 15cm thick and the whole box was covered by 6 slabs; Arnold reports that the walls were carefully sanded. Its purpose is a mystery, anything deposited in it would then have its roofing slabs fitted; and then one assumes that the access point in the west wall would be bricked up, covered with clay and whitewashed to remain hidden forever. However, it was robbed, the brick was tore out of the wall along with two of the wall slabs of the cell, but it appears that S4 was just filled with brick.[99] Arnold provides some dimensions for S4, which appear to be internal dimensions judging from his plate 55, they are 1.28m long, 0.73m wide and 1.18m high, so a sizeable container.

Arnold reports that when he entered S3 it was bricked up to the ceiling and filled with brick debris so that he could not crawl through it; though he was convinced robbers had entered from here. In his fig 26 which shows the breach into S4, the start of the breach is some 70cm above the floor, so if Arnold could not crawl through S3, how did the robbers breach into S4? It might seem strange to whitewash a passage, if it was decided to fill it with brick; the south tomb like the rest of the substructure suffered stresses, which are clearly shown by some of the cracked and deformed masonry of the cells; even the roofing slabs of S4 were push downwards. Given the design of S4, and given that the passage was covered with clay and whitewashed it would seem strange to just fill S4 with brick, then brick up the wall, cover with clay and whitewash it. A scenario might arise that something valuable was inside S4 originally, its location disguised as the passage wall was whitewashed. At the time of its insertion, structural problems may not even have existed, then later as problems arose and the King decided to abandon his pyramid, what happens to the contents of S4? The king could order the contents to be removed, and as the rest of the substructure was being shored up with brick, timber and stone, the workers emptied S4 and replaced it with brick like so many of the cells in the south tomb. There are other permutations, but it's hard to get a clear picture of what Arnold exactly found in the area; the detail on S4 for example amounts to only one paragraph, and not much more for passage S3.

The next item we come to is S5, which Arnold describes as a Ka-chapel. Access to S5 is via a brick lined side passage that branches off S3 to the east; it is 2.71m long, 0.92-1.00m wide and 2.21m high: the opening for this passage is 12.40 to 13.30m from the start of S3. This side passage along with a portion of passage S3

[99] Ibid, page 55-56

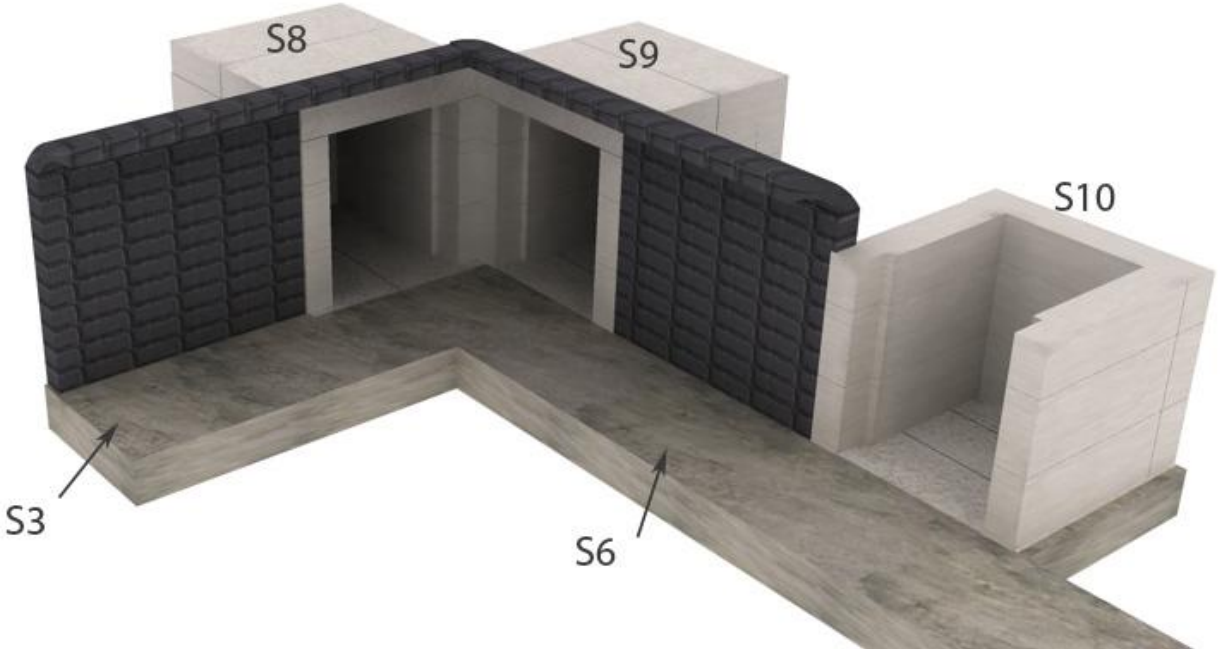
was blocked with 6 to 7 layers of limestone blocks, with a few layers removed at the top to admit robbers. The stone blocking in the passage S3 started at 11.30m and appears to finish at the spot where the ceiling is lowered to 1.62m; so around 2.3m of S3 appears to be blocked with stone. The stone filling did not extend into the Ka-chapel itself, instead S5 was filled with brick.

The above view gives an idea of the layout of S5; the solution to carry the brick vault over the side passage entrance was to lay 3 wooden beams to support the vaults. The Ka-chapel is a sizeable space; its internal dimensions are 1.56m deep, 1.33m wide and 1.54m high; and the quality of the stonework is very impressive, so it was an important space that required extra care. Arnold found S5 filled with brick that the robbers had only partially ransacked; nothing was found other than two smooth limestone slabs, which may have had a function as closure plates.[100]

[100] Ibid, page 57

Arnold would state; *"Since not the slightest remains of any objects were found in the rubble of the chapel and the lower brick layers of the brickwork were undisturbed, it must be assumed that the Ka chapel was never equipped with any content."*[101] That said, I feel it is possible like S4 that it may have contained items, which were removed when the decision was taken by the king to abandon the pyramid: the chapel would be emptied, shored up with brick, and the passage blocked with stone; this in itself seems a lot of work to protect an empty space, but the same could be said for the numerous chambers in the Kings apartments, that were filled with brick, even though they contained no contents. The structures may have been abandoned, but it appears that it was important that they be protected even when empty. Like so many of the small cells that occupy the south tomb, the ceiling and floor slabs of S5 were badly cracked.

At the south end of S3 we come across the first of 6 smaller limestone cells, whose quality of work, though careful, is not of the same high standard as shown in the three Ka-chapels S5, S15 & S18.



Looking into the corner of where passage S3 meets S6, we see the start of 6 similar sized limestone cells; their internal size appears to be a floor square of around 1.06m (2 cubits) and height around 1.25 - 1.27m.[102] The brick arches of the passages took advantage of the stone lintels of the cells, just like the wooden

[101] Ibid, page 57

[102] Ibid, page 58, In Arnolds fig 28 he has the scale drawing showing S8 at some 1.3m deep; though his table of measures for the six cells on page 58, state a depth for S8 of 1.06.

beams at S5, though how the brick ceilings solved the puzzle of turning the corner is not know as these areas were too badly damaged. The rebated walls of the entrance would allow closure stones to abut against them to seal the cells, though there is no report of such closure stones; this rebate was also cut into the lintels, and much like we see in the Ka-chapels, whose entrance also appears to be 2 cubits wide. The 5 cells along passage S6 have their centers spaced between 3.61 – 3.74m (a possible 7 cubits). Stresses are also apparent in these cells, with cracked ceilings; contents are practically nonexistent: Arnold would state; *"The Chapels were originally bricked up to their ceiling without exception. The robbers therefore failed to clear out the chapels. We also found no traces of a former content, apart from two limestone lamps of Middle Kingdom type."*[103]

Passage S3 runs for some 18.25m were it joins passage S6; the long passage S6 extends to the junction of S16 & S14, though in effect it continues westwards to the junction of S17; though this section has been given the title of S7. Midway along S6 there is a noticeable kink in the passage; Arnold suggested that such a feature would hardly be intended, and that possibly the passage was dug from two directions, resulting in an error, which had to be corrected.[104] The total length of S6 & S7 amount to about 66m and the passage is located some 4 to 5m outside the pyramid. The width of the passage is around 85cm, with the height varying between 1.67-1.76m high, and constructed like the other brick lined passages.

S6/7 had likewise been filled with brick, though robbers had tunneled under the ceiling on the north side; inside this tunnel was found some of the limestone blocking from Ka-chapel S15, along with some alabaster fragments believed to come from the lid of the canopic chest found in S15.

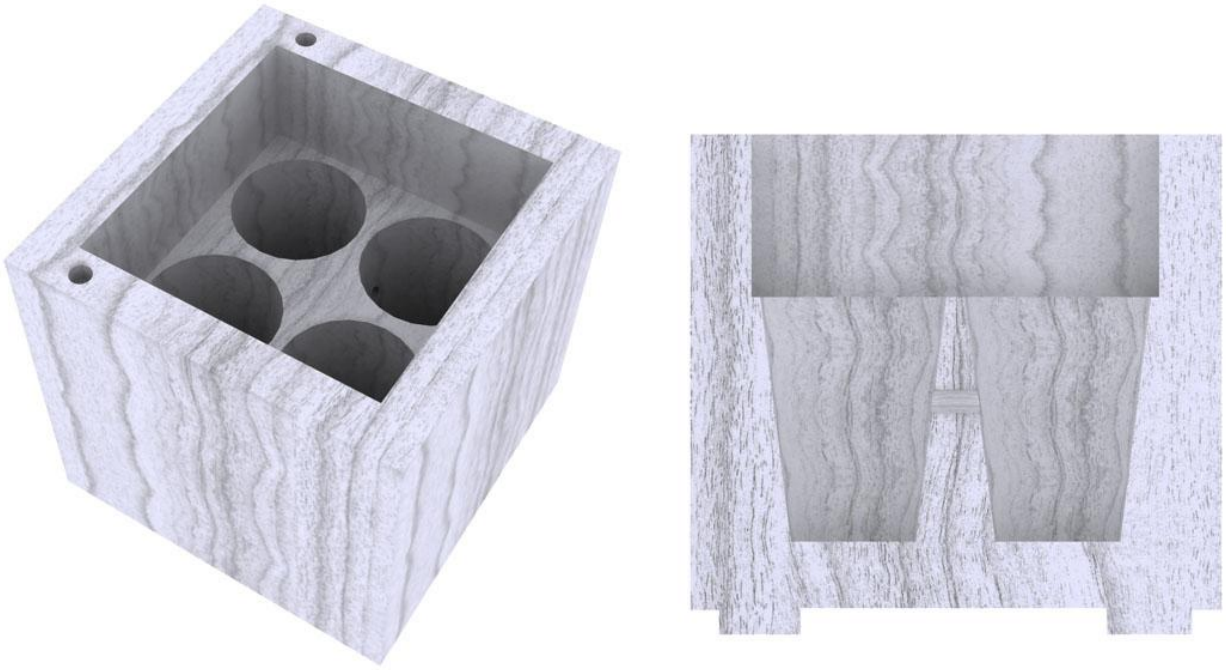
The Ka-chapel S15 is constructed in the same manner as S5, it's side passage being some 2.18m high, so one assumes like in passage S3 we have a high section in the passage of S14, that steps down to a lower height to enable it to meet the junction of S6/7. Unfortunately, we have no side elevations of these passages to help in determining the various passage heights; though in Arnold's plate 52, the height of S14 appears to be 1.5m high, where it joins W17. Like S5, the side passage and a 3 to 4m portion of S14 were blocked with limestone blocks.

Inside S15 was found a fine alabaster canopic chest, without its lid; fragments of carnelian, faience, ivory and gold foil, suggested the presence of inlaid boxes: also found were wooden fragments believed to be the statue of a woman, about a cubit high, whose wig had a deep hole in the crown which Arnold suggested held a pair of Ka arms, such as we see in the wooden statue of King Hor.

[103] Ibid, page 58
[104] Ibid, page 57

Image courtesy of Jon Bodsworth

Wooden Statue of King Hor found in one of the shafts north of the pyramid.



The reconstruction of the fine alabaster canopic chest is based on Arnold's fig 29; by scale rule the box has a foot print of about 61cm square and height about 55cm. The box has four tapered holes about 27cm high and each pair of holes is connected by a smaller hole, as shown in the section above.

Unlike the other Ka-chapels S5 & S18, we find that S15 still had its closure stones; the 61cm deep doorframe was blocked with five 1.18m long, 30cm high and 58cm deep stone beams; the upper closure stone had been turned out, presumably by the robbers. Beyond the closure stones Arnold states; *"Since the completely ruffled interior of the chamber was found to be mostly filled with broken bricks and filled with only a few limestone's, one must assume that the interior of the chamber was mainly bricked over the objects placed there."*[105] This chamber like the rest had a large crack in the middle of its ceiling, with the beams being pushed downwards.

The blocking of the passage S14 in brick and stone, which led to S15 shows a confused picture, with Arnold suggesting a possible restoration at some point, he states; *"The walling up of the access to the Ka-chapel S15 was not only like the walling up of the corresponding chapels S5 and S18 – broken up by the robbers, but we also believed we could see traces of a subsequent restoration. The masonry of large blocks marked with red marks started from the south immediately before the junction to S15, filled this junction completely and extended another 3 – 4m to the north, but only in the upper half of the corridor, Because after the robber*

[105] Ibid, page 60

break-in (or during this?), the fragments of the wooden objects of the Ka-chapel was spread over the broken bricks of the half cleared corridor and then the upper half of the corridor was walled up again with limestone blocks."[106]

The last Ka-chapel S18, is constructed like the previous two, its side passage was 2.26m high and so I assume a segment of the passage S17, which led to S18, also reflected this height and was reduced accordingly like in S3. S17 is described as being about 96cm wide, 1.68m high and with a total length of 20.8m. Stone blocking of the side passage and part of S17 follows that of the previous two Ka-chapels, robbers had made their breaches; however, S18 was empty, except for a 24cm thick layer of earth that was completely devoid of finds. It's not clear from the report if the five large closure stones that filled the door frame of S15 were also found here; Arnold would state that the blocking stones had been moved by robbers, and neatly piled high inside S18. Arnold provides two images, plate 27a, of inside S18, and plate 27b which shows the entrance into S18 and the side passage: both images show similar sized limestone blocks inside the side passage and inside S18. There is no indication of any large closure beams that we see sealing the doorframe of S15; it could be argued that such large beams were broken up by robbers and stacked inside the chamber; however, plate 27b shows quite extensive blocking of the side passage, taking up a considerable part of the entrance height of S18. This is logical, in that robbers only need to remove enough material to effect entry to the chamber, so in this scenario the lower large closure beams should still be intact, (we recall that in S15, all 5 closure stones remained in the doorframe, with just the top one pulled out to gain access) there would be no requirement to break them all.

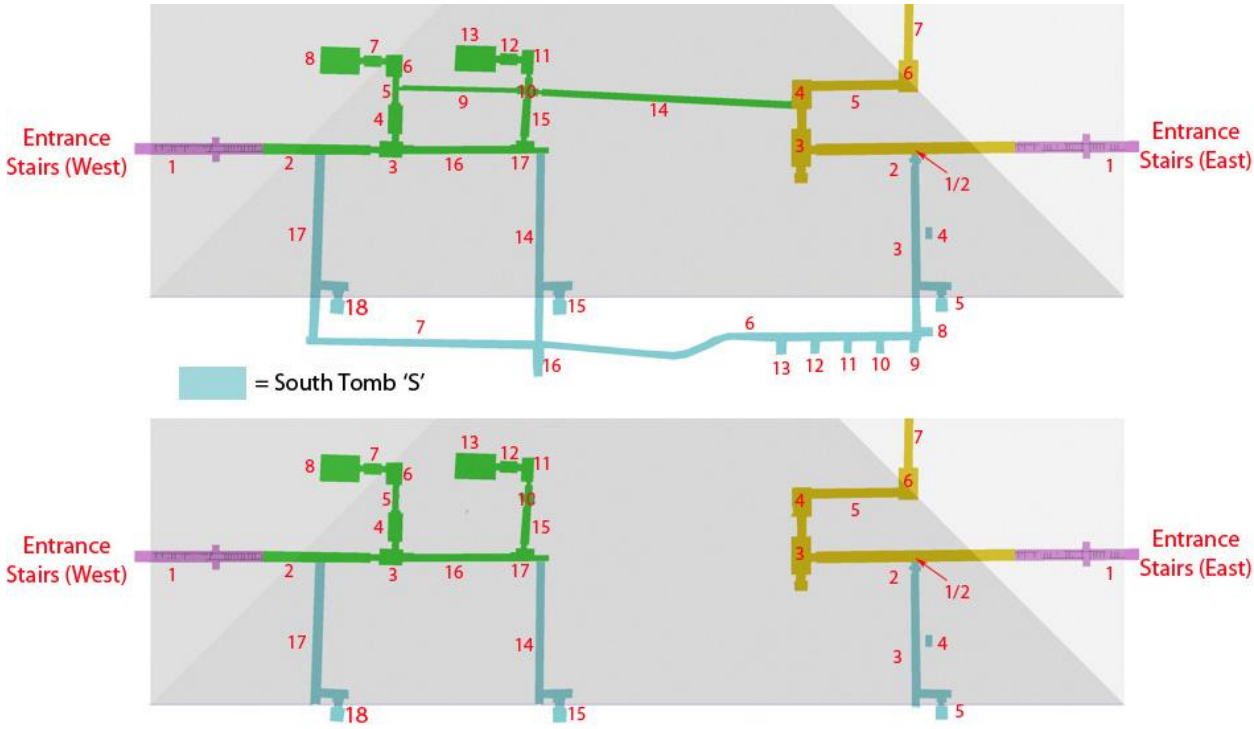
The available data to me suggests that we might have a similar situation to that found in Ka-chapel S5, in that neither appears to have been used, or were emptied shortly after the building disaster, and then shored up; one with brick and the other with stone. This might raise the question that if S18 was the Ka-chapel of queen Aat, and not used; was she even buried in the pyramid?

Just south of S18 in the corner where passage S17 & S7 meet, a niche is found as if S7 was intended to go further west. This niche was found to be whitewashed, but then bricked over again.[107] The niche may have been intended to help in improving the turning radius in this corner.

[106] Ibid, page 59-60
[107] Ibid, page Ibid, page 57

The last item in the south tomb is S16, which is to be found at the junction of S6/7 & S14. All that remains of this construction is four foundation slabs; its height is unknown though Arnold thought it would be smaller than the Ka-chapels, but larger than the units S8 to S13. Its front was not in the passage wall but placed back by about 1m; a brick lined entrance that was whitewashed suggest that the construction was finished, along with gypsum traces on the foundation stones that show that the walls had been fitted.[108]

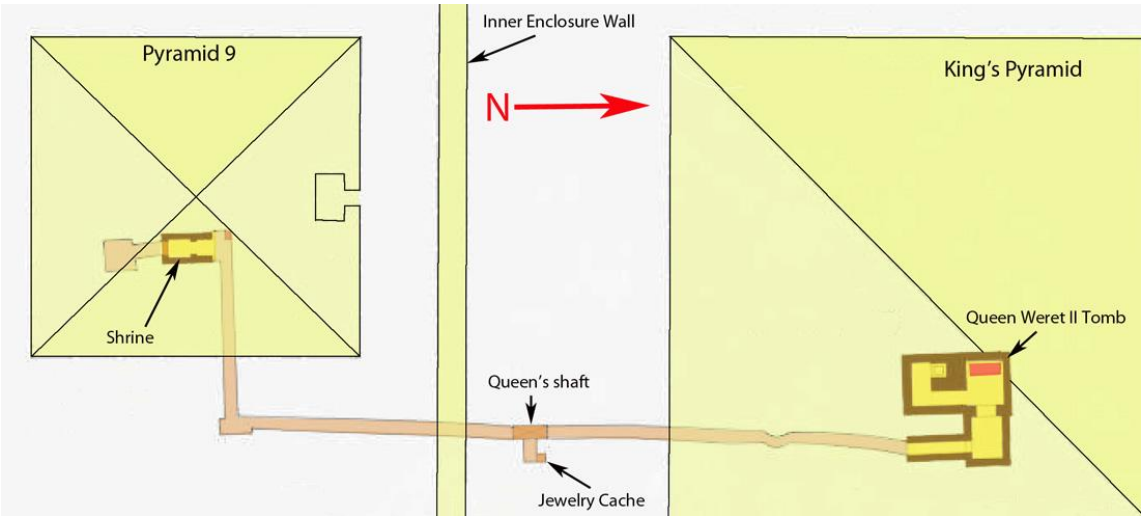
We appear to have a chamber that was removed, and as Arnold noted it is unlikely to be linked with the building disaster, as its removal would only increase the risk of collapse; moreover, the passages had to be open and unblocked to effect its removal. Arnold thought that maybe they wished to recycle the material for other constructions in the south tomb. The resulting void from its removal was filled up with tafl rubble and covered with roughly layered bricks; then the entrance was bricked up and plastered over: only the falling of the plaster made the entrance visible again.



The layout of the south tomb appears strange, as well as being a security concern; could the lower plan above be the original intent of the builders, with the rest being later modifications? The construction of S1/2 is a concern as this effectively closes access to S5, and the large opening in the floor of O2, is an awkward obstacle to the introduction of materials to the inner tomb; moreover, it's rough unfinished

[108] Ibid, page 60

nature, suggest a later construction, so was this a later modification, and if so, what does it tell us about the state of play in the construction of O2; was it lined with limestone? Small chambers similar to the south tomb are to be found under the three pyramids south of the northern brick pyramid; one of which was connected to the Queens apartments, as shown below.



Above we see a chamber similar to the Ka-chapels in the south tomb under pyramid 9, of the northern brick pyramid.[109] A similar small structure was found under pyramid 7, whilst the middle of the three, pyramid 8, had an even smaller chamber, just large enough to hold a granite canopic chest of similar small size to that found in S15. The function of all these small chambers found in the south tomb and in the southern small pyramids at the northern brick pyramid, is uncertain, though it has been suggested that they are related to the ka of the deceased.

The Pyramid Temple

The stone robbers have done such a thorough job on the temple, which abuts the east face of the pyramid that even the foundations have been removed. De Morgan found a few statue fragments in the vicinity, bearing the cartouche of the king. That the temple existed is confirmed by the abundance of fragments, be it fragments of reliefs, along with fragments of granite and limestone papyrus columns etc. The extensive debris over the site meant that Arnold could only excavate a 13m by 20m area, so further clearance might reveal more. The presence of a north chapel is not known; De Morgan dug a trench in this area as part of his

[109] See my layman's guide on The Pyramid Complex of Senwosret III.

search for the subterranean chambers, but reports no mention of a north chapel; the extensive debris in this area prevented Arnold from excavating.

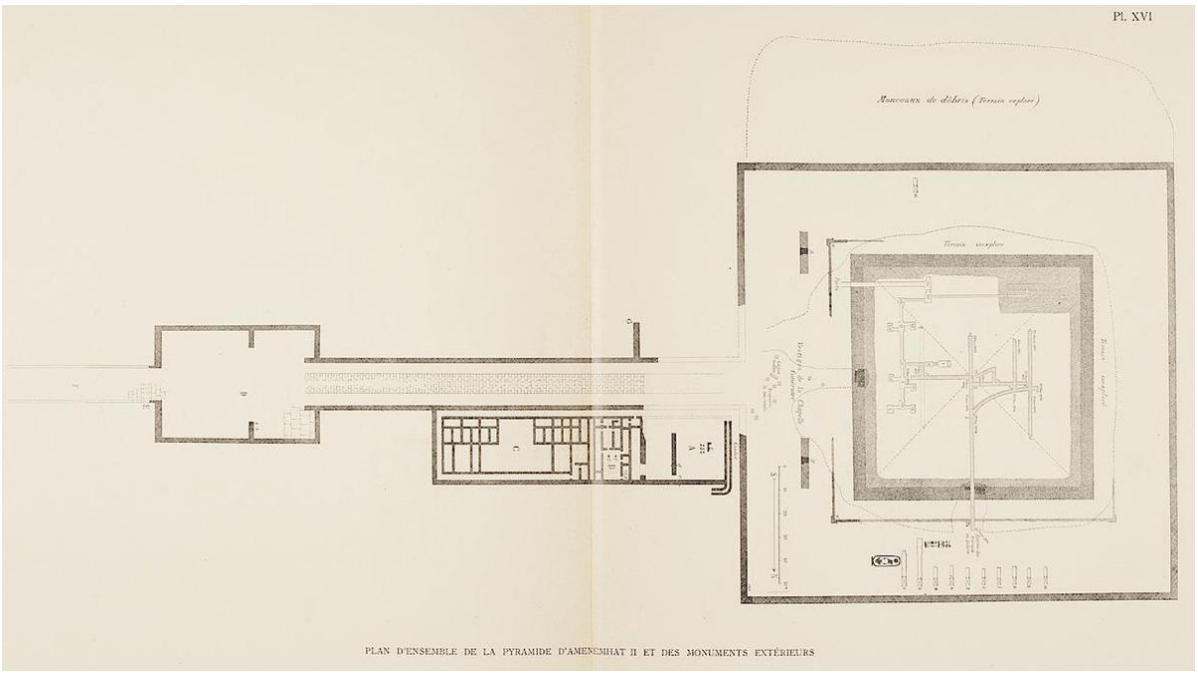
The Enclosure Walls

Both enclosure walls follow the format seen in other Middle Kingdom pyramid complexes, in that we have a plain outer wall and an inner wall decorated with a niche façade. Generally we should expect the inner wall to be constructed of stone, though here it is constructed of brick. This is probably a logical choice; the failings of the pyramid structure probably meant that the king had already started his Hawara pyramid complex, and was content to finish his Dahshur complex in lesser materials.

The outer brick enclosure wall Arnold gives as 186.9m N-S, and 189m E-W (The base of the Bent pyramid would fit over this enclosure wall; Dorner's mean length of the four sides of the Bent was 189.6m). The plastered brick wall was about 2.63m thick or 5 cubits at its base, with the foundations 1 cubit wider. Little remained of this wall, and so an exact determination of the wall was not possible.[110]

The inner wall was badly destroyed, but the best preserved sections suggest that it was also around 5 cubits wide. It was built on foundations that appear to have been visible as these were plastered white, whilst the outer enclosure wall foundations appear to be hidden. Arnold states that the outer wall was constructed first, and then the area behind it to the pyramid base was leveled, with tafl and limestone chippings; then the decorated inner wall was constructed on this elevated level. Arnold would find a large limestone block at the northeast corner whose niche decoration corresponded to that of the brick sections of the wall, so suggested that the wall may have started in stone and finished in brick.[111] Though given that it was found in a corner location, it might be the case that these areas were reinforced with stone only.

[110] Ibid, page 64
[111] Ibid, page 67



In De Morgan's plate XVI above, we can see the outer enclosure wall, and east of the pyramid two short sections of inner wall, and then closer to the pyramid the outer edge of the pyramid foundation trench. The constructions outside of the outer enclosure wall that extend to the east, I have unfortunately little information on.

The causeway De Morgan describes is quite wide; he gives a total width of 18.55m, of which 8.55m is paved with stone along its middle axis, and then 5m either side is paved with mud brick. His section of the causeway is shown below.

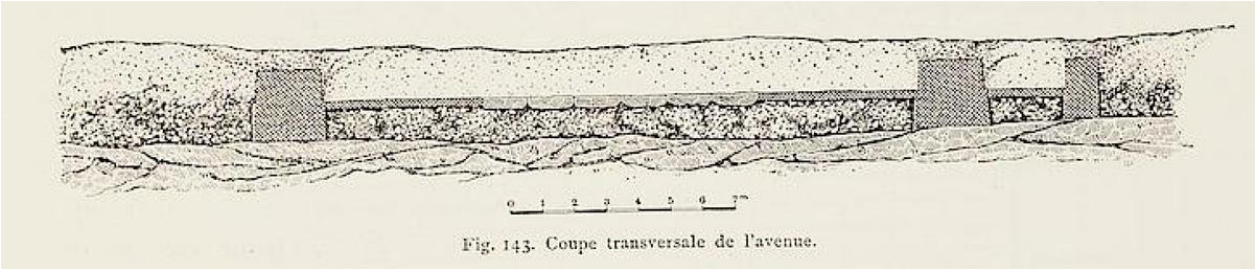
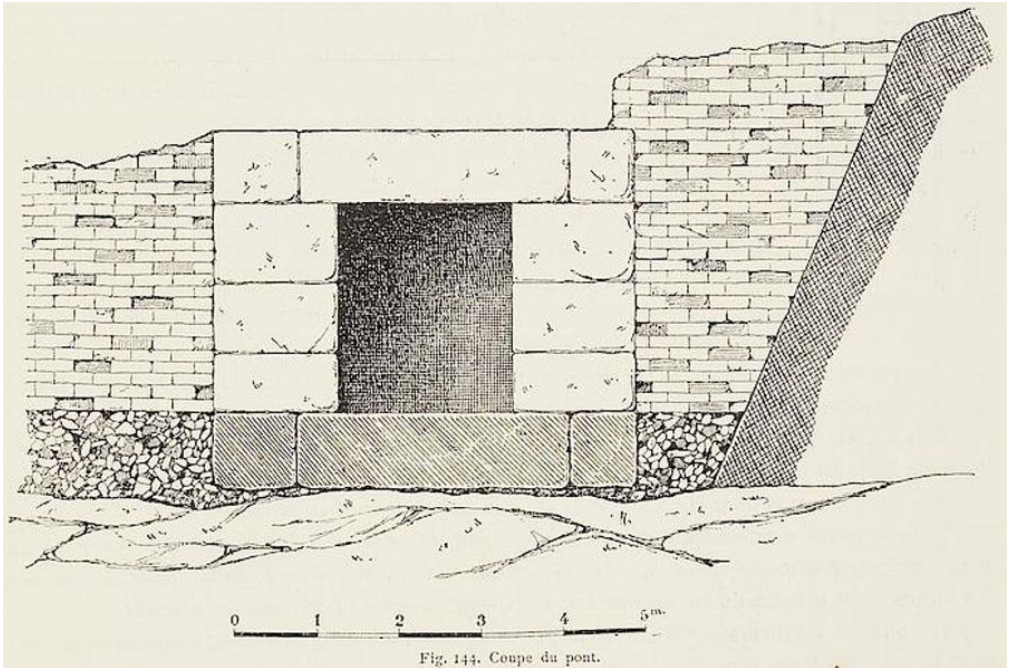


Fig. 143. Coupe transversale de l'avenue.

De Morgan reports that the causeway bridged over a moat. The bridge was constructed of large blocks of limestone, and he gives it as 4.80m wide and some 5.20m long; his drawing of it is shown overleaf.



De Morgan's Bridge

To the north of the causeway De Morgan discovered the remains of buildings made up of a succession of courtyards, rooms and corridors, and it has been suggested that this collection of buildings was the priests' settlement.[112] De Morgan states that the causeway heading east enters into a vast, once paved courtyard, before continuing to descend gently towards the valley. I assume this large courtyard is the valley temple and that the causeway extended beyond to a possible harbour.

In Arnold's report he reports that in 1976, R. Stadelmann discovered a limestone model of the interior of a royal tomb in a pit, at the southwest corner of the valley temple. Arnold thought that it plausible that this model was a schematic model of the interior of the Hawara pyramid or a building close to it. Miroslav Verner would state; "*One of the most interesting objects found in the badly damaged valley temple was the limestone model of the underground passageways and chambers in a Thirteenth Dynasty pyramid that has not yet been discovered."*[113] Since Verner's publication, two new sites have been discovered that could lay claim to this model; one is a small pyramid discovered in south Dahshur in 2017, and the other is Tomb S10 at Abydos, thought to belong to a 13th dynasty king, Sobekhotep IV. Of course similar structures may yet be buried under the sands awaiting discovery; but currently I feel tomb S10 best matches the stone model found at Dahshur.

[112] The Pyramids, Miroslav Verner, page 427
[113] Ibid, page 427

Concluding Remarks

In 1939 the British Prime Minister Winston Churchill said of Russia; *"It is a riddle, wrapped in a mystery, inside an enigma; but perhaps there is a key".* Such a quote sums up the Black pyramid perfectly; is there a key, maybe; however, as a layman, the data is insufficient to come to any definitive conclusion that best explains what we find under the Black pyramid. Arnold's excellent report is always a compromise on what to report versus publication costs; ideally such a complex structure would benefit from several volumes. His Volume one is quite condensed, and one is always seeking more information, drawings, images etc; it's hard to get a clear picture of what he found. There is probably a huge amount of unpublished images and drawings available; access to those along with access to the structure itself is beyond the resources of an amateur layman, and it would be great for more institutions to follow the great work of The Giza project at Harvard University, and make such data more readily available.

What happened at the Black pyramid is all too evident; poor site selection and the resulting problems. How it first manifested itself is unknown, was it sudden or slowly gradual; one could image a particularly high Nile level in one year that could have caused sudden movement in the structure. Amenemhet's solution was to build a new complex at Hawara, and here he took no chances and built the proverbial brick outhouse; in addition he took levels of tomb security to a whole new level: though even here his tomb appears to have been robbed in quick order, as subsequent Middle Kingdom pyramids have rectified the weaknesses of his Hawara design, by inclining the portcullises, and providing hard stone lintels and slides to prevent robbers from circumventing the portcullises.

What became of the Black pyramid is hard to say; does he complete it as best he can as some sort of cenotaph? How many times has the structure been opened, robbed, restored, opened, robbed, restored etc, etc, the permutations are endless. Can we even say with certainty that queen Aat was buried in it; the evidence is tenuous, the poor quality limestone canopic chest found broken seems odd, along with the empty Ka- chapel S18. The only certainty is that the structure exists, and that you run the risk that it will make you an insomniac if you try to find its key. I enjoy my sleep, so I am running up the white flag on this structure. The good news is that the Black pyramid is now open to tour groups, so hopefully in years to come, we will get some hi resolution videos and images of the inside, which hopefully can provide more clues.

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